AUTOMOTIVE INDUSTRIES
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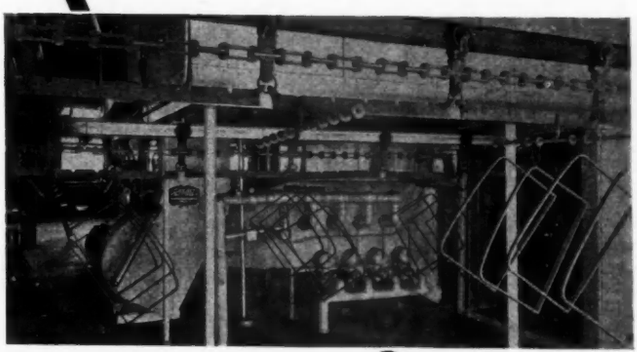

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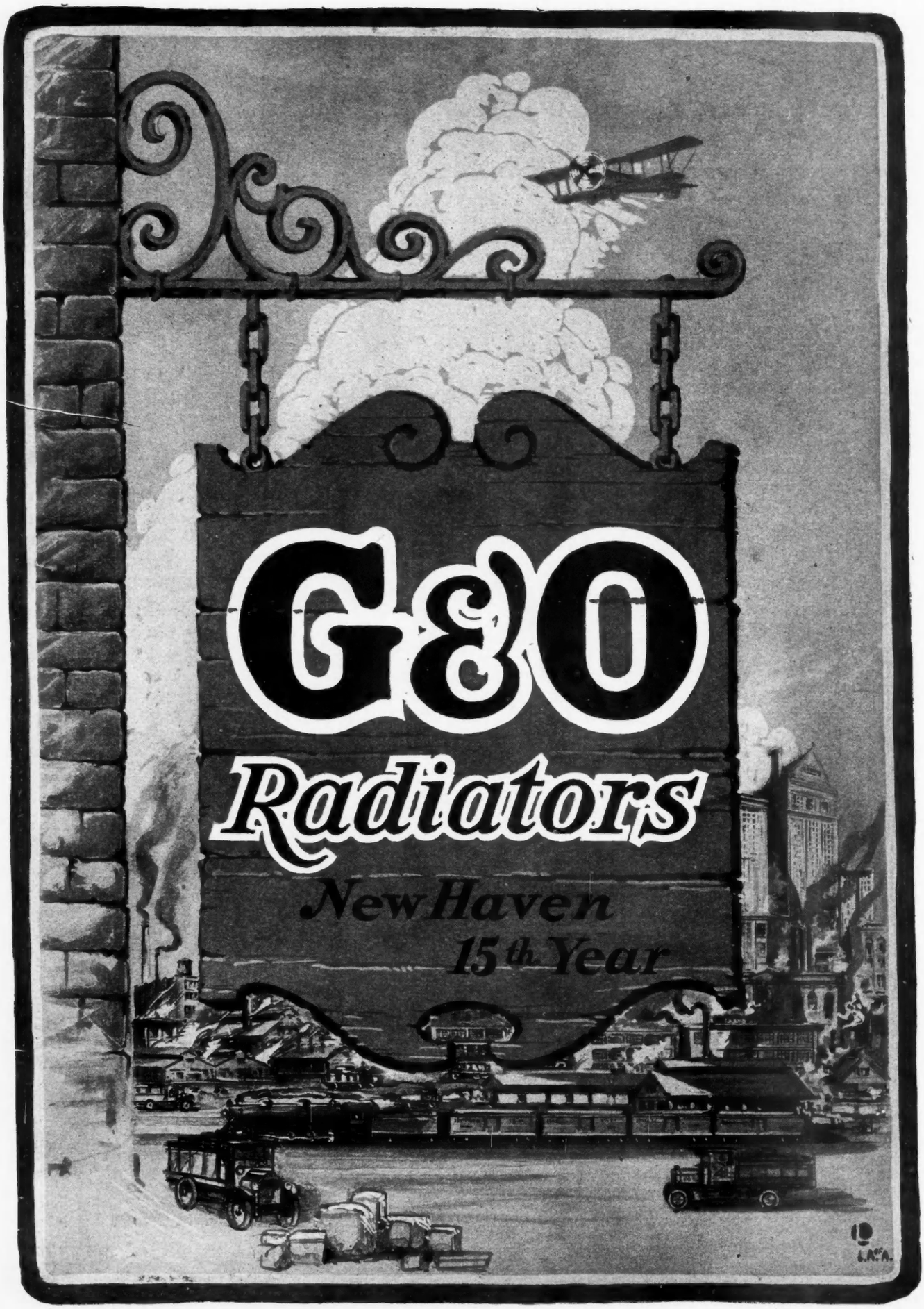
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AUTOMOTIVE INDUSTRIES

VOLUME 62 APRIL 12, 1930 NUMBER 15

BUSES IN GRIP OF TAX TANGLE

Need of drastic alteration in methods used by States in exacting revenue from new utility found by the National Association of Motor Bus Operators

TAXES on common carrier buses are too high and, irrespective of amounts, there is need for drastic alteration in the methods now used by most of the 48 states in exacting revenue from this new public utility, according to a preliminary report made by the National Association of Motor Bus Operators.

The investigation on which these conclusions are based has been limited almost wholly to original sources, consisting of representative information secured from 20 per cent of the common carrier buses through questionnaires distributed direct to the operators.

The investigation further limited itself to 1928 data alone. Earlier material is out of date. Later material is not yet available. One incidental conclusion, however, may not be avoided. It is that these taxes in 1929 were higher than in 1928, and that in 1930 they will be still higher. This is due in a very small part to an inevitable increase in the average size of the vehicle. But it is primarily due to increases in the gasoline tax rate, and other rates, and to increasing mileage per vehicle due to increased efficiencies in operation.

Since an actual count of taxes paid by the bus is neither available by states nor for the country as a whole, and since there is great variety in both tax basis and tax amounts among the different states, as well as variety in rates within almost any given rate, it became necessary at the outset to classify buses according to use, i.e., whether in (1) city service, (2) intercity but intrastate service, or in (3) interstate service. It also became necessary to classify taxes as to purpose, i.e., whether for (1) general governmental expenses, or for (2) the special expenses incurred by the government due to the existence of the bus line and the operation of its buses on the highway.

General taxes are those taxes which a bus operator pays, irrespective of the fact that he owns buses or operates them upon the highway. They include property taxes, capital stock taxes, other corporation or business taxes paid by businesses in general, and in short, all taxes to which others not in the bus business or not upon the highway are also subject.

In this discussion, that property tax which is applied to motor vehicles as a special property or luxury tax and which is not applicable to all taxable property alike is included with general taxes simply because its segregation is too difficult. It is really a special tax on motor vehicles.

Special taxes are those taxes which an operator pays because he is in the bus business or because he operates motor vehicles on the highway. They are really highway taxes. They include license fees, the gasoline tax, regulatory commission fees, and the gross receipts or seat or weight or mileage taxes.

Buses	General Tax Paid	Average Per Bus
2015 Intercity (intra and interstate)	$177,181	$87.93
2394 Intercity (intrastate)	205,441	85.81
1654 Intercity (interstate	139,711	84.46
4321 City	384,998	89.10

From these figures it may be gathered that the character of the operation is not a factor in general taxation. This is consistent with the nature of the tax. Therefore, and since the data is territorially representative, it may be assumed that the average of all the data, i.e., $87.37, would be a fair average. However, a correction of something over 2 per cent is advisable in that the physical valuations represented due to the size of the vehicles are slightly above the average, but also because it was calculated that these averages were generally distorted by about plus 2 per cent, due to the slightly greater number of responses from high-tax states. The correction is therefore applied throughout.

Eighty-five dollars would represent a correction here of 2.7 per cent and may be used as the average general tax per bus. Federal taxes are eliminated in this and following considerations.

Twenty-four companies operating 4321 buses in city service had answered in full detail association questionnaires. The following per bus averages were obtained:

General taxes	$89.00
All special taxes	579.00
Total state and local taxes	$668.00
Total in per cent of investment (less depreciation to 1/1/'29)	7.52
(Average seating capacity..... 33.36)	

Of course, the average seating capacity is large—which means high gasoline

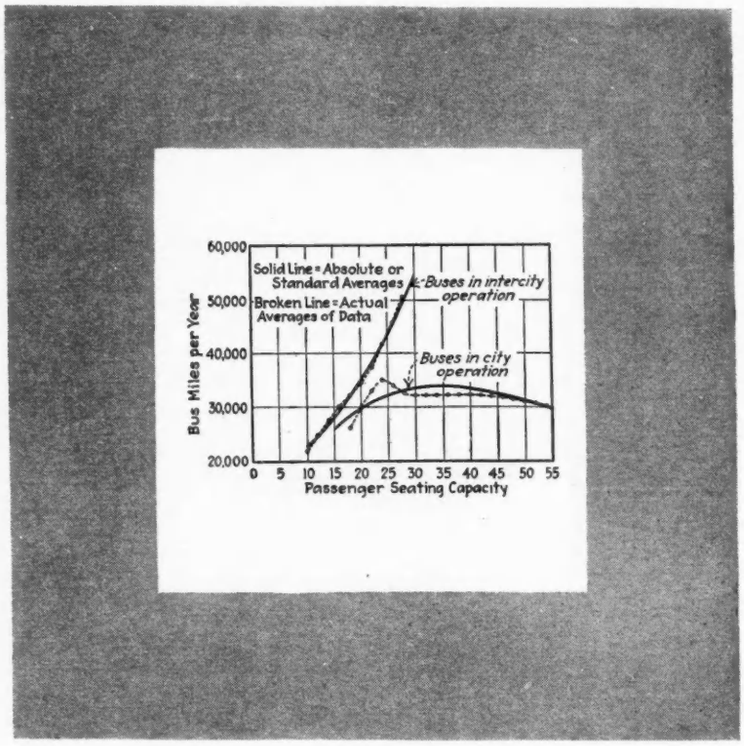


Fig. 2—Annual bus-miles per bus expressed in relation to seating capacity

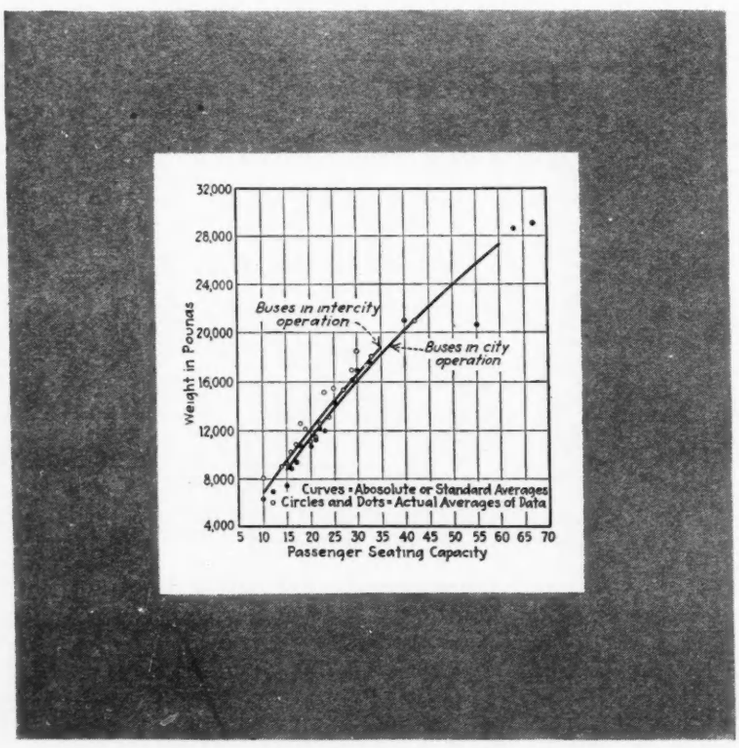


Fig. 1—Passenger seating capacity shows a direct relationship to weight for both city and intercity buses

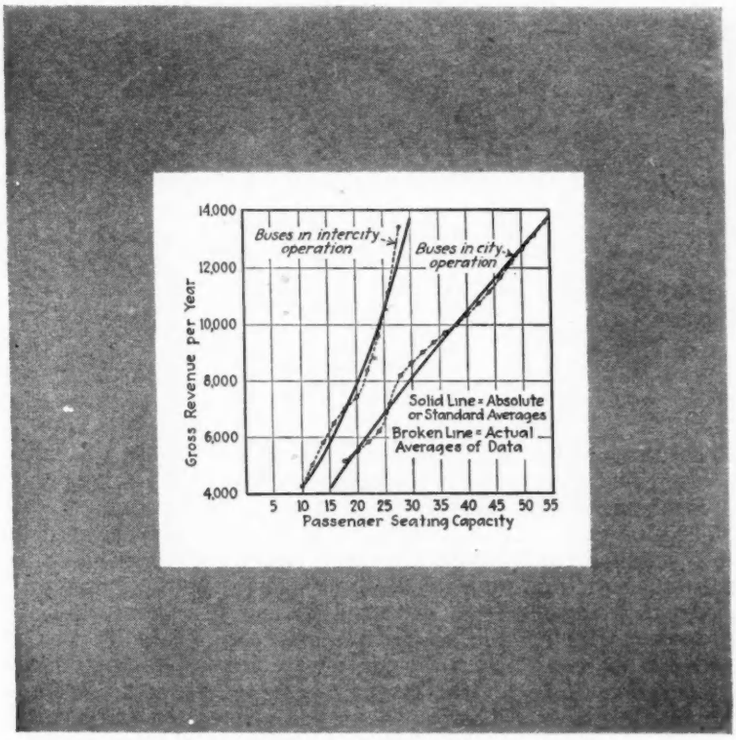


Fig. 3—Annual gross revenue per bus compared with seating capacity for city and intercity buses

consumption and gross receipts. But this is reasonably compensated for by the fact that the figures include the Fifth Avenue Coach Co. of New York and the Chicago Motor Coach Co., operating double-decked buses almost exclusively. Both were in non-gasoline-tax states for the 1928 period.

However, the special tax figure of $579 was cut down to $565 (2.4 per cent lower) and a general tax of $85 was added. Thus $650 was obtained as the average state and local tax per city bus.

Out of the cost and the tax questionnaires there were 78 responses which would be included in this group. The companies operated 2394 buses. They were representative. They paid per-bus taxes as follows:

General taxes	$86.00
All special taxes	428.00
Total state and local taxes	$514.00
Total in per cent of gross	5.95
Total in per cent of investment (less depreciation to 1/1/'29)	7.87
(Average seating capacity.... 24.96)	

An analysis was also made of the state laws by applying them to a common vehicle with estimated average characteristics. The average of the estimates by states (the mean) so obtained was $521, and the median was $423. These were considerably higher than the average from the questionnaire data by states (the mean), which was $$418, and the median which was $403. Our data, therefore, are conservative.

There was such wide variety, however, between the data and the estimates by states as to preclude wholly averages for any given state; hence such a presentation is avoided here.

The interstate bus easily ranks as the highest taxpayer on the highway. This is largely because its taxes are multiplied according to the number of states on whose highways it operates, but also because the special demands upon the vehicle increase the tax both at home and abroad.

The 27 companies exclusively in this group which replied operated 1654 buses. They paid per bus:

General taxes	$84.00
All special taxes	641.00
Total state and local taxes	$735.00
Total in per cent of gross	5.89
Total in per cent of investment (less depreciation to 1/1/'29)	10.06
(Average seating capacity..... 24.68)	

Our figure of $710 was estimated at $85 for general taxes and $625 for the special taxes and gas tax. Six hundred and twenty-five dollars is 2.5 per cent lower than the computed average above.

(Continued on page 595)

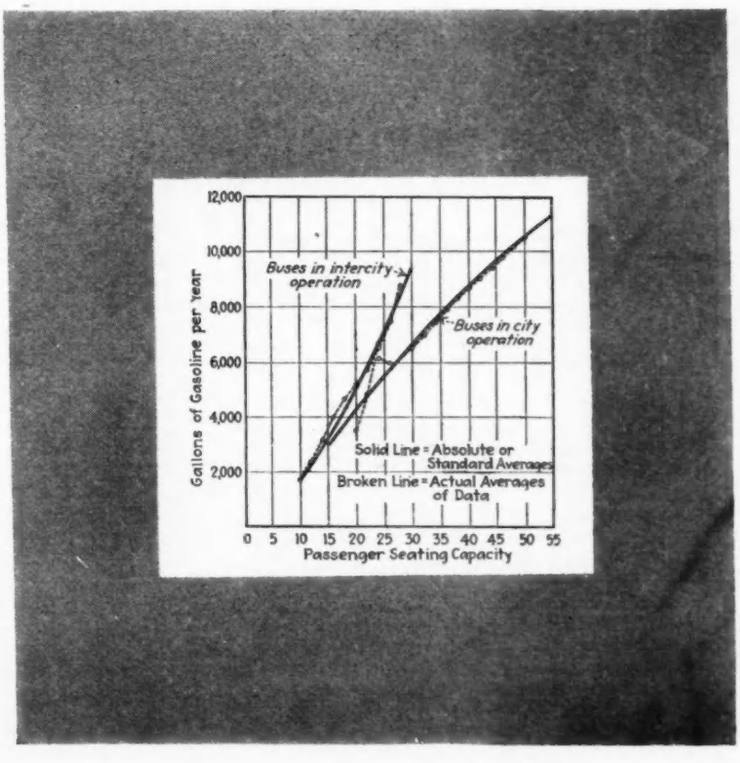


Fig. 4—Annual gasoline consumption per bus compared to seating capacity

A craft of interest at the All-American Aircraft Show at Detroit was the 32-passenger Fokker four-motored plane

Aircraft Show at Greater Numbers

By Athel

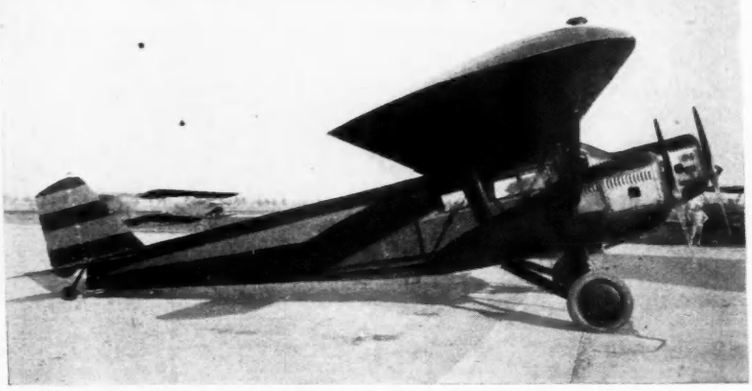
DETROIT'S new $1,000,000 hangar and exposition building, dedicated last Saturday, proved an ideal place for the 1930 Aircraft Show. The elimination of the necessity of dismantling ships for transportation to the exposition building proved effective in attracting the larger transports in numbers. Moreover, with a substantial flying field, having fully concreted runways to the exposition building, demonstrator planes were present in greater numbers, and public interest was centered in one section instead of being spread out between airport and exposition.

Outstanding in public interest seemed to be the 32-passenger Fokker, while the Packard Diesel, described in these columns last week, attracted the expected widespread attention from the trade. As in St. Louis, the tendency toward lower prices by some of the larger companies again formed an important topic of conversation. This time it was due to the price reductions, ranging from $4,000 in the case of its standard Universal and its 14-A mail plane to $13,000 in its F-10 trimotor 14-place ship announced on Monday by Captain E. V. Rickenbacker, vice-president of the Fokker Aircraft Corp., division of General Motors, recent reduction in prices of the Curtiss-Wright line, some reductions by Detroit Aircraft, and others.

Parts suppliers are not in the happiest frame of mind over this situation, since they will be expected to bear the brunt of reduction in manufacturing cost. The effect has been, however, to give some of the parts suppliers more substantially definite commitments, replacing the hand-to-mouth, month-to-month buying which has characterized the entire aviation industry recently.

Of the new airplanes exhibited for the first time in Detroit, a large proportion are represented in the accompanying photographs. Additional information follows:

Bellanca Aircraft Corp. exhibited its new Skyrocket, a Wasp-engined edition of its Pacemaker. Chief differences structurally are in the wings and tail surfaces, both of which have been enlarged, the wing span



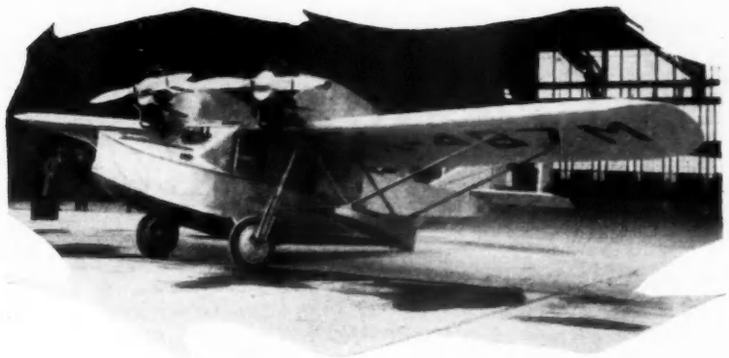
The trend to more and more all-metal design is emphasized by the introduction at Detroit of the metal fuselage edition of the Lockheed Vega (top)

A multi-engined ship introduced at the Detroit show was the six-place Osprey, manufactured by the Ogden Aeronautical Corp. of Inglewood, Cal. It is priced at $18,900

View of Detroit's $1,000,000 municipal hangar and exposition building located on the new municipal airport within 20 minutes of the downtown district. An idea of the size may be gained from the ship shown near one of the entrances

Detroit Attracts by Facilities

F. Denham



All-metal amphibion produced by the Issoudun Aircraft Co. shown at the All-American Exposition in Detroit

being increased 2 ft. 4 in. Fin and rudder are of steel, with adjustable stabilizer and elevators of wood.

Consolidated Aircraft Corp. exhibited its latest model, the aluminum alloy monocoque Fleetster, eight-passenger, high wing, cabin monoplane. Wings are wood with plywood covering. Tail surfaces are of aluminum. The engine is mounted in rubber and provided with an N.A.C.A. cowling.

Crosley Aircraft Co. presented its experimental sports and training plane, the "Moonbeam," a two-place open biplane powered with an experimental 100-hp. air-cooled inverted in-line engine under development by the same company. Structurally, the ship is quite conventional, with a welded unit cabane. Ailerons are all-metal with corrugated dural skin, torque-tube operated.

Detroit Aircraft Corp. was represented by several new models. The Ryan speedster marks the entrance of that division into the three-place open-cockpit type field again. It is available with either a five-cylinder Wright or Axelson engine. *Lockheed,* famous for its wooden monocoque construction, has turned to aluminum alloy fuselage construction, with ring-type braces and flat dural covering. Lockheed Vega is an addition to the line, the wooden-fuselage type being continued. Both are fitted with Wasp engines. A Packard Diesel installation was shown in the Ryan foursome.

Ford, with the announcement last week of optional Packard Diesel installations, exhibited a trimotor thus equipped. *Fokker,* as elsewhere mentioned, was represented by its 32-passenger transport and its parasol single-motored F-14.

A new amphibion, still experimental, was shown by *Issoudun Aircraft* of Northville. Of all-metal construction, it uses Hyblum, a nickel-aluminum alloy, containing no copper, and claimed to be non-corrosive and to have a higher yield point than dural. Hull structure is of the girder type with flat sheet covering. Wheel retracting mechanism is hydraulic. Wheels in the retracted position are horizontal and expected to add to the lift of the ship.

The lowest-priced transport yet to make its appearance is the Stinson Airliner, listing at $23,900, and powered by three Lycoming engines (top). Note the wide-tread landing gear

A two-place experimental sport and training plane marks the entry of William Powell Crosley, Jr., into the aircraft field. It is powered by an inverted four-cylinder in-line engine experimentally developed by Crosley Aircraft Co.

An example of powered glider construction is the "Kite" produced by Simplex. It is practically all wing and has a 3-cyl. engine

Oakland Wage *Incentive System*

Experimental work in materials-han bonus method to non-productive efficiency is measured in te

By JOSEPH

HERALDING another advance in industrial management, an experiment with a novel adaptation of the Wennerlund group wage incentive system inaugurated this year at the plant of the Oakland Motor Car Co., promises to effect important savings in the overhead burden. Although great strides have been made in the automotive field in the reduction of direct labor cost, comparatively little has been done in the direction of overhead burden and it still remains a necessary evil with rather undefined limits. In seeking a rational means for reducing the overhead burden, the operating department decided upon the expedient of applying the group wage incentive idea to non-productive or indirect labor. And to avoid complication at the outset, the experiment was limited to one special group, consisting of related materials-handling operations including the shipping departments, receiving departments, stock handlers, etc., comprising a group of about 300 employees.

Briefly, this materials-handling group is organized as a unit in each separate plant, under a supervisor in each plant who is held responsible for its operation. Stripped of the technicalities that will be discussed later, the entire group, regardless of the diverse nature of individual duties, operates as a unit whose combined efficiency is measured in terms of the direct labor payroll in the plant which they serve. A searching analysis into the relation between the cost of operating this group and the direct labor payroll, extending over a period of years, has produced a "normal" or measuring unit, expressed in terms of hours per dollar of productive labor. This "normal" is the key to the entire setup. It is necessarily an experimental value which for obvious reasons is set as low as is practical, and by the same token it is susceptible of adjustment if an adjustment is found necessary or advisable.

The mechanism of this plan now unfolds itself clearly. The "normal" factor multiplied by the direct labor payroll, provides a definite standard hour unit of accomplishment for the group, thereby establishing a rhythmic cycle in which variations in the productive payroll are followed more or less closely by corresponding changes in the non-productive payroll. Accordingly, the degree of flexibility achieved by the group with the added advantage of individual accomplishment, determine the efficiency of the group against the definitely established standard and directly determines the amount of cash reward to be distributed among the members of the group in proportion to their individual earning capacity.

Obviously, perfection cannot be attained with this idea, due to unavoidable variations in production rate with their consequent reflection on wage payments.

FORM 3486A

NON PRODUCTIVE GROUP CONTROL

GROUP NAME _____ DEPT _____

RESPONSIBLE HEAD _____ REPORTING TO _____

PAY PERIOD ENDING _____ FOR DAY OF _____ TYPED _____

TODAY		CUMULATIVE FROM				CUMULATIVE FROM			
				AVR. RATES				AVR. RATES	
STD. HRS.	ACT. HRS.	STD. HRS.	ACT. HRS.	BASE	EARNED	STD. HRS.	ACT. HRS.	BASE	EARNED

PERIOD CLOSING DATA

FOR CUMULATIVE PERIOD FROM _____

BASE AMOUNT $

AVERAGE EFF %

AVERAGE BONUS %

TOTAL BONUS EARNED $

BONUS PREVIOUSLY PAID $

BONUS DUE THIS PERIOD $

NORMAL $

ACTUAL $

DIFFERENCE $

NOTE
NORMAL - STD. HRS. X EARNED RATE

NON-PRODUCTIVE LABOR CONTROL - WAGE RATE ONLY
Set Up of Actual Moneys Against Normals

Semi-Monthly Period _____

Dept.	Productive Labor	Normal Money Per $1.00 of Prod. Labor	Total Moneys This Period				From _____ ToDate _____		Remarks
			Normal	Actual	Under	Over	Normal	Actual	

Normal _____

Actual _____

Difference _____

Form 2—(Above) A report based on the information given in Form 1 is submitted periodically to the plant superintendent at Oakland for his guidance

Form 1—An aid in accurately charting experience with a certain normal, and to provide a test for other experimental values. This form is one of the keys in the Oakland Wage incentive plan

Promises Savings in Overhead

dling group inaugurates plan to apply or indirect labor. Combined unit rms of direct labor payroll

GESCHELIN

ROUTING SHEET

Indirect Labor Control.

Dept. Name _____ Group No. _____

Dept. _____ Group _____ Entire Material Group including Receiving, Shipping, Stores, Line Delivery, etc.

N.P. No. _____ Hrs. per $1.00 of Prod. Labor _____

Charge Account K 150 B

Note: Productive Labor as noted is the entire Plant 5 Productive Labor. The Productive Labor as credited each day will be the Productive Labor as shown on Daily Burden Report.

Effective Pay Period beginning Feb. 25th, 1930.

Form 3—After the group standard is fixed, a routing sheet is set up, showing the normal for each group

However, a degree of stability is expected through the use of a cumulative average of bonus payments, the averages running over a period of twelve weeks, or six pay periods, as will be explained later. Bonus payments are further stabilized by setting up pay periods of two weeks, thus making only six pay periods for a unit in which the bonus payment is averaged. An interesting feature is that in the first pay period of each unit of six pay periods, the group is paid the exact amount of the bonus. And, in unusual cases of idle time due to causes beyond the control of the group, a special allowance is made which compensates for loss in efficiency.

The term "experiment" is used advisedly since the basic principles underlying this system have been carefully prepared and in all probability will not require revision. The variable experimental factor appears to be the "normal" which fortunately is a flexible unit lending itself to a wide range of adjustment, without affecting the arrangement. The operating management of the plant is thoroughly sold on this idea and is very optimistic about the direct savings which are expected in the order of five figures for the first year of operation.

With this brief introduction we are prepared to examine critically the elements and application of this wage incentive system. Obviously, the "normal" is the key and demands careful analysis and sound judgment in its determination. Accordingly, Form 1, "Non-Productive Labor Control," has been devised to aid in accurately charting experience with a certain normal and to provide a test for other experimental values. Form 2 is a report based on information obtained from Form 1 and is submitted periodically to the superintendent of the plant for his guidance and suggestions.

During the test period, the method of attack follows the course of non-financial incentive control in which the psychological effect of a close follow-up has proved to be very effective. With a minimum normal thus established they have taken the next step in an effort to cut the burden still more by offering a cash reward for increased efficiency.

NON-PRODUCTIVE GROUP CONTROL

Cumulative Average of _____ Periods

PAY PERIOD ENDING _____

GROUP NAME _____ GROUP NO. _____

CREDIT BASIS: PRODUCTIVE LABOR

	PREVIOUS PERIODS	PAY PERIODS ENDING				
		⑤ STD. HRS.	⑥ ACT. HRS.	⑦ BASE AMT.	⑧ %	BONUS
		1800 ~	2000 ~	1200	90	120 ~
		2000 ~	2500 ~	1500	80	60 ~

	①	②	TOTAL AVERAGE		
PART NO.					
REQ. NO.	NP 139		THIS PERIOD	③	④
STD. TIME	.065			% EFF.	% BONUS
FRI. TUES.	3000			195	199
SAT. WED.	2950			192	200
SUN. THURS.	2900			189	190
MON. FRI.					
TUES. SAT.					
WED. SUN.					
THURS. MON.					
FRI. TUES.					
SAT. WED.					
SUN. THURS.					
MON. FRI.					
TUES. SAT.					
WED. SUN					
THURS. MON					
TOTAL			1800 ~	2000 ~	3800 ~

CURRENT PERIOD COMPUTATION

BONUS EARNED LAST 2 PERIODS	173 00
DEDUCT BONUS PAID PREVIOUS 1 PERIODS	120 00
BONUS DUE THIS PAY PERIOD	53 00

BONUS DUE $ 53.00 ÷ BY CURRENT PERIOD BASE AMOUNT $ 1500.00 EQUALS 3.5 %

BONUS WHICH GIVES AN AVERAGE EFFICIENCY FOR CURRENT PERIOD OF 79 % +

ACTUAL BONUS PAID $ _____

LAST _____ PERIODS AVERAGE

% EFF.	BONUS %	TOTAL BONUS EARNED
84.5	6.7	173.00

Cumulative Average Efficiency from Date

	STD. HRS.	ACT. HRS.	BASE	BONUS	TOTAL	EARNED RATE PER HOUR
PERVIOUS PERIODS						
THIS PERIOD						
TO DATE						

Form 4—Control of group activities and knowledge of group performance are accomplished by keeping a running record on the above form

Table I—Symbols

H_s = hours standard

H_a = hours actual

R_h = rate per hour (cents)

E = earnings in dollars

S = normal factor = hours per dollar of productive labor

P = productive labor payroll in dollars

B = bonus in per cent

F = bonus in dollars

Expected results are virtually guaranteed by the incentive of a cash bonus offered to a group of men ordinarily employed on a fixed hourly rate, or day rate. When a group standard normal has been definitely established, the routing sheet, Form 3, is set up and filed with the cost department. This form specifies the format of the group and shows the established normal for this particular group, since normals vary from plant to plant.

In this setup the effectiveness of the scheme depends entirely upon the group supervisor, as it is his function to vary the size of the group daily against daily variations in the direct labor payroll with which he is kept acquainted. Naturally, then, the size of the group is variable and at the discretion of the supervisor will vary either by changing the number of men or the number of hours that they work. Controlling the size of the group has more complexity than is evident on the surface, because the flow of materials and consequently the size of the group is necessarily out of phase with the direct labor situation under certain conditions. For example, experience at the Oakland plant shows that a marked increase in production schedules is not directly reflected in the direct labor payroll for almost two weeks. During this time interval or phase lag, raw materials are being received at an accelerated rate, necessitating an increase in the materials-handling group. Yet the efficiency of the group is artificially depressed because it is now operating with an augmented force greatly exceeding the apparent standard time indicated by the direct labor payroll. Conversely, as the productive labor force is stabilized with respect to the increased production rate, the demands on the materials-handling group drop sharply since it is comparatively easy to feed the lines at a uniform rate from a largely accumulated store.

Accordingly, bonus earnings during short periods may become inordinately large or may disappear entirely. And it is to meet this situation that the method of averaging pay periods has been devised as a means of stabilizing bonus payment.

Control of the group activities and an accurate knowledge of its performance are accomplished by keeping a running record on Form 4, "Non-Productive Group Control." The operation of this form will be clarified by the following discussion based on the fictitious figures used for illustration. The headings on this form are, of course, self explanatory. Columns 1 and 2 are used differentially, depending upon the pay period for the particular group. Thus Column 1 is used with a pay period beginning Friday, whereas Column 2 is used with a pay period beginning Tuesday. The figures in Column 1 represent the daily direct labor payroll in dollars for the plant; Column 3, representing the normal standard hours, is obtained by multiplying the daily labor payroll by the normal as indicated in Formula 5, Table 2; Column 4 represents the actual hours consumed each day.

The totals of Column 3 and Column 4 represent the working figures for the first wage period of a new quarter. For convenience these figures have been transferred to the first line at the top of the form. Formula 1 in Table II expresses efficiency which in this particular case is 90 per cent as noted in Column 8. Column 7 represents the base wage for the group as a whole and for convenience 60 cents an hour has been chosen as an average hourly rate so that the product of 2000 hours at 60 cents per hour becomes $1,200. Referring to Table IV, we note that the bonus rate for 90 per cent efficiency is 10 per cent of the base wage for the entire group, resulting in a bonus allowance of $120. This lump sum is then divided among the members of the group in direct proportion to their base rate earnings.

Succeeding bonus payments for a duration of six pay periods are calculated by averaging the figures for a current period with the general average of the preceding payrolls, as explained in the following example. Let us assume a second payroll period with the figures as shown in the second line at the top of the form. The actual earned bonus is $60, but the amount paid to the group depends entirely upon the average net bonus calculated as follows: At the foot of Columns 5, 6 and 7 appear the totals for the two periods. The calculated efficiency for this combined total is 84½ per cent, which earns a bonus of 6.7 per cent and a total bonus in dollars of $173. Now refer to the portion of the form at the extreme right, headed "current period computation." The total bonus earned for the last two periods is $173, as indicated. From this is deducted the total amount of the bonus paid to date. In this case it is $120, representing the bonus for the first pay period. It is understood, of course, that during the course of a quarter this sum might represent the total of 3, 4 or 5 preceding periods

Table II—Basic Formulas

$\frac{H_s}{H_a}$ = efficiency in per cent 1

$H_a \times R_h$ = base wage in dollars 2

$F = B \times H_a \times R_h$ = bonus in dollars 3

$B = \frac{F}{H_a \times R_h}$ bonus in per cent 4

$H_s = S \times P$ = hours standard 5

$E = H_a \times R_h + B \times H_a \times R_h = (1 + B)\, H_a \times R_h$ 6

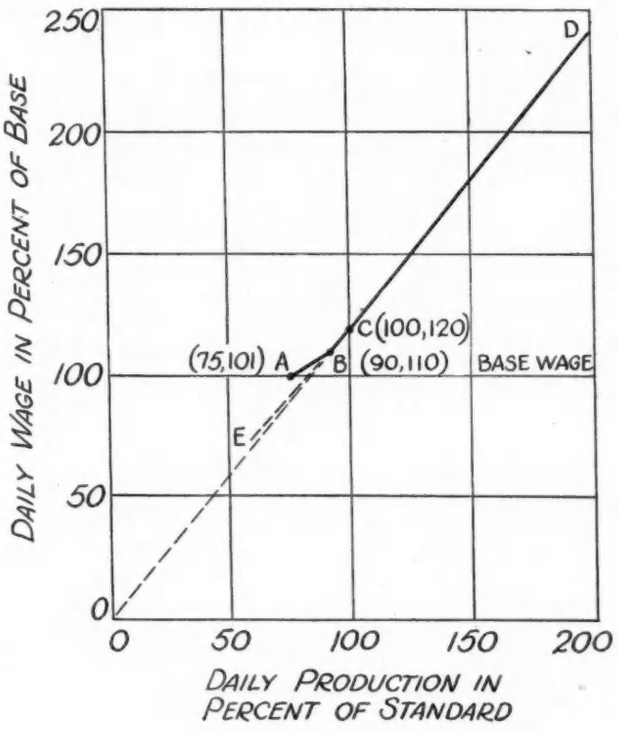


Fig. 5—Earnings curve upon which the Oakland wage incentive plan is predicated. It is plotted from figures in Table IV

Table IV—Bonus Rates

Per Cent Eff.	Bonus	Per Cent Eff.	Bonus	Per Cent Eff.	Bonus
75	1.0	117	40.4	159	90.8
76	1.6	118	41.6	160	92.0
77	2.2	119	42.8	161	93.2
78	2.8	120	44.0	162	94.4
79	3.4	121	45.2	163	95.6
80	4.0	122	46.4	164	96.8
81	4.6	123	47.6	165	98.0
82	5.2	124	48.8	166	99.2
83	5.8	125	50.0	167	100.4
84	6.4	126	51.2	168	101.6
85	7.0	127	52.4	169	102.8
86	7.6	128	53.6	170	104.0
87	8.2	129	54.8	171	105.2
88	8.8	130	56.0	172	106.4
89	9.4	131	57.2	173	107.6
90	10.0	132	58.4	174	108.8
91	11.0	133	59.6	175	110.0
92	12.0	134	60.8	176	111.2
93	13.0	135	62.0	177	112.4
94	14.0	136	63.2	178	113.6
95	15.0	137	64.4	179	114.8
96	16.0	138	65.6	180	116.0
97	17.0	139	66.8	181	117.2
98	18.0	140	68.0	182	118.4
99	19.0	141	69.2	183	119.6
100	20.0	142	70.4	184	120.8
101	21.2	143	71.6	185	122.0
102	22.4	144	72.8	186	123.2
103	23.6	145	74.0	187	124.4
104	24.8	146	75.2	188	125.6
105	26.0	147	76.4	189	126.8
106	27.2	148	77.6	190	128.0
107	28.4	149	78.8	191	129.2
108	29.6	150	80.0	192	130.4
109	30.8	151	81.2	193	131.6
110	32.0	152	82.4	194	132.8
111	33.2	153	83.6	195	134.0
112	34.4	154	84.8	196	135.2
113	35.6	155	86.0	197	136.4
114	36.8	156	87.2	198	137.6
115	38.0	157	88.4	199	138.8
116	39.2	158	89.6	200	140.0

omitted here for the sake of simplicity. Then, by direct subtraction the net bonus is found to be $53, instead of the $60 actually earned. By a converse process of figuring, using Formula 4, Table II, the average corrected efficiency of the group is found to be 79 per cent, instead of the real efficiency of 80 per cent, undistributed.

An analysis suggested by C. W. Lytle in "Wage Incentive Systems," permits us to study the earning curve employed in this scheme, thereby unfolding some interesting angles. Fig. 5 shows the earnings curve upon which this system is predicated, plotted from the figures given in Table IV. The character of the earning curve is now graphically revealed. The base wage line is located at 100 per cent on the vertical axis. It is immediately evident that the earning curve has three distinct slopes at the critical points, A, B and C. Accordingly each section of the curve has been mathematically analyzed and the resulting algebraic formulae shown in Table III. Observe that between points A and B, representing a range in efficiency of 75 to 90 per cent, the slope of the earning curve is 9/15, indicating a 60 per cent, return on the savings effected. Between points B and C, representing a range in efficiency of 90 to 100 per cent, the slope of the earning curve is unity, indicating returns exactly equal to the saving. Above point C in the region exceeding 100 per cent efficiency, the slope of the earning curve is 120 per cent.

It is an interesting fact, particularly in equations 8 and 9 (Table III) that the last ele-

(Continued on page 584)

Table III—Earning Curve Formulas

Point *A* (75, 101) for $\frac{H_s}{H_a} = 75$ to 90%,

$$E_A = 1.01 \times H_a \times R_h + \frac{9}{15}\left(\frac{H_s}{H_a} - 75\right), \text{ where } \frac{9}{15} \text{ is the slope of the curve} \quad 7$$

Point *B* (90, 110) for $\frac{H_s}{H_a} = 90$ to 100%,

$$E_B = 1.10 \times H_a \times R_h + \left(\frac{H_s}{H_a} - 90\right) \text{ the slope here is unity} \quad 8$$

Point *C* (100, 120) for $\frac{H_s}{H_a} = 100\%$ and up,

$$E_C = 1.20 \times H_a \times R_h + 1.20\left(\frac{H_s}{H_a} - 100\right), \text{ where the slope is 1.20} \quad 9$$

Louis Coatalen, managing director and chief engineer, Sunbeam Motor Car Co.

Carburetor *Troubles* *Speed* Trials,

Louis Coatalen, chief engineer of of changes in air intake posi six-cylinder, high-speed Diesel

THE April meeting of the S.A.E. Metropolitan Section, held on the 2d inst. at the A.W.A. Clubhouse, New York, was a dual affair, in that there were two subjects and two speakers, but each of the two spoke on both of the subjects. The speakers were Louis Coatalen, managing director and chief engineer, and Frank Martinuzzi, chief experimental engineer of the Sunbeam Motor Car Co., Wolverhampton, England. The topics of their talks were the Silver Bullet, the Sunbeam racer at present in Florida with the object of breaking the world's speed record, and a new high-speed Diesel engine developed by Mr. Coatalen. In introduction to the talks a Fox newsreel was shown which depicted the Silver Bullet on the beach at Daytona.

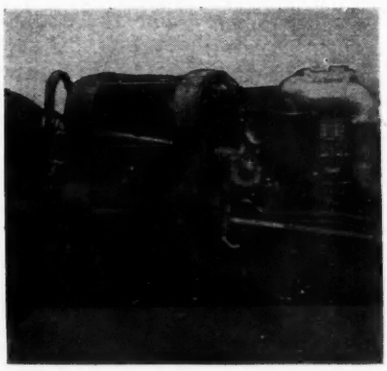
Mr. Coatalen explained that the reason the Silver Bullet had not been able to do any better so far was that it had been impossible to properly balance the gaseous pressures at the inlet to the carburetor and in the float chamber. The air intake for the carburetor is located outside of the bonnet and facing in the direction of motion, and this introduces problems that were not met with when testing the racer on the dynamometer in England. Mr. Coatalen said he planned to place the carburetor inlet in still air again, under the hood, and cut off all direct connection with the outside, which he thought would remedy the difficulties.

The speaker also expressed the opinion that this was the first time a car had been specially designed from the ground up for the purpose of attacking the speed record. This included the engines, which are of the 12-cylinder type and have an angle of 50 deg. between cylinder banks, instead of the more usual 60 deg. The way this angle was arrived at was to trace the projection of the driver's body in the seated position and hold the width of the engine down to that of this projection. Two engines are placed in tandem. Their bore is 5½ in. and their stroke 5⅛ in., hence the stroke is less than the bore. This short stroke permits of running the engines at 4000 r.p.m. The cylinders are cast in blocks of three, of aluminum alloy, and they have liners of Nitralloy, with glass-hard wearing surfaces.

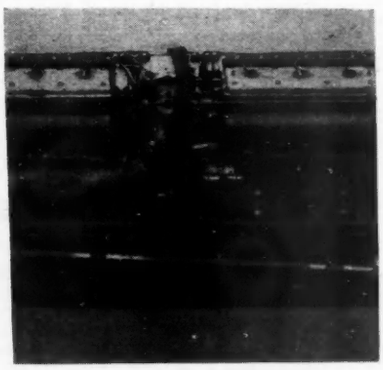
In order to make it possible to use a smaller clutch, the engines are not coupled together directly, but each crankshaft is geared up to a shaft passing through the lower part of the crankcase, and these two driveshafts are coupled together by means of a positive coupling of the internal and external gear type. This permits slight variations in alignment without binding at the bearings. At 4000 r.p.m. of the crankshaft the clutch shaft turns at 7000 r.p.m.

One of the features of the engine is the exclusive use of roller bearings on the crankshaft. Mr. Coatalen had considerable experience in developing aircraft engines during the period of the war, and he expressed the opinion that during the next war plain crankshaft bearings would not meet requirements, as the crankpin or big-end bearing are a limiting factor in engine load capacity. The crankpins of the engine are 60 mm. (2⅜ in.) in diameter and there are two series of rollers on each pin, of ¼ in. diameter and the same length. Short rollers are required because skewing must be prevented. The rollers run directly on the case-hardened crankshaft and in a split bearing. Although many engineers have declared that it is impracticable to run rollers in split bearings, the Sunbeam company has done this in its racing cars for many years and has had no trouble with the bearings.

Mr. Coatalen described many



Close-up view of the blower and carburetor at the rear of the Silver Bullet's engine. A detail of the steering mechanism is also shown



At the right is shown the section between the two engines, with the supercharger connection. Note also the shaft of the steering mechanism along the frame

Delay Silver Bullet S. A. E. *Hears*

Sunbeam, tells Metropolitan Section tion to assist racing car. Dyack engine discussed reservedly.

Dyack six-cylinder conversion compression ignition engine

other features of the Silver Bullet, most of which have been printed in these columns previously, however. He gave some illustrations of the tremendous centrifugal forces that have to be coped with at the high speeds necessary to break the record. For instance, the clutch is held in engagement by means of a coiled spring made of wire of about ½ in. diameter. This spring is surrounded by a steel sleeve for most of its length, but since the spring must have freedom to expand and contract, a short portion at one end was not surrounded by this sleeve. These end coils opened up permanently under the influence of centrifugal force. To remedy this the gap allowing for expansion and contraction was placed at the middle of the length of the spring, both ends of which were housed.

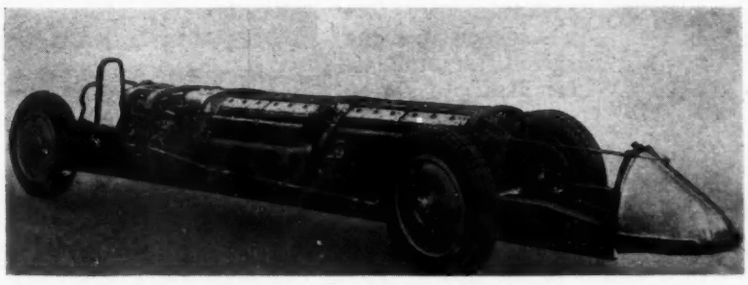
Another thing that emphasizes the tremendous centrifugal force is the fact that the rubber tread on the tires used is only ½ mm. thick. If a thicker tread were used the increased centrifugal force would cause it to separate from the fabric. The tires, moreover, are the thing that limits the maximum speed that it will be possible to attain through traction by ground adhesion, Mr. Coatalen said, the makers of the tires having impressed upon him that a speed of 300 m.p.h. must not be exceeded, as the tires would not be able to withstand the resulting forces.

In reply to a question by A. L. Beall, Mr. Coatalen said the fuel used in the Silver Bullet was a half and half mixture of alcohol and benzol, which had been found to give the coolest engine. To this mixture 3 per cent of ether was added to increase the range of volatility and inflammability. Pure castor oil is used for the lubrication of the engine and Castrol gearbox lubricant for the transmission.

It was also explained that the car is provided with a wind brake in addition to its hydraulic brakes, which latter are based on the Lockheed principle. By friction and air resistance alone the car will come to a stop from a speed of 300 m.p.h. in a distance of 7000 yd. (4 miles). Cooling is effected by means of an icebox holding 750 lb. of ice, through which the cooling water circulates. Since the duration of each run is less than ½ minute it has been found that there is a considerable surplus of cooling capacity and some ice usually remains in the tank at the end of each run.

While both Mr. Coatalen and Mr. Martinuzzi were very frank with relation to the Silver Bullet, they displayed considerable reserve with respect to the details of the Coatalen high-speed Diesel engine. It appeared that the basis of this engine was a 120 hp. aircraft engine, the Dyack, designed by Mr. Coatalen during the latter part of the war, which he later converted so as to make it possible to operate it by oil injection. It appeared from the few details given that a single pump is used which places the fuel oil under pressure and that injection is effected by mechanically opening individual injection valves for the separate cylinders. This would make the engine of what is here known as the common rail injection type.

The Coatalen system of fuel injection was also applied to a Benz-Sendling Diesel engine. This is a tractor engine employing the precombustion chamber principle. The maximum speed and maximum output of the engine were greatly increased by substituting the Coatalen fuel injection system for the original one, but no explanation of the details of the system was given, aside from the fact that the fuel is sprayed into the combustion chamber through holes of 0.005 in. diameter. The engine is a six-cylinder type of 120 mm. bore and 130 mm. stroke.

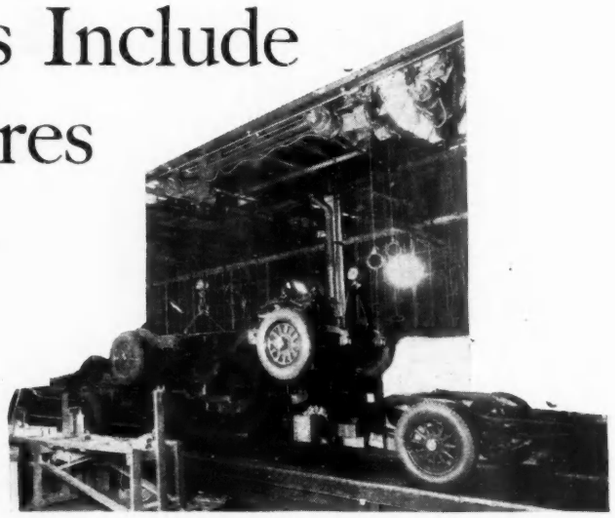


The Sunbeam Silver Bullet, stripped to chassis and engine

Reverting to the Silver Bullet, it was pointed out that every effort had been made to reduce the air resistance to a minimum. The body was laid out to conform to the outline of the driver's body as closely as possible, and further refinement was attained by subjecting it to the wind-tunnel tests and modifying the shape to reduce the air resistance. Mr. Coatalen said these wind-tunnel experiments had been very satisfactory in that the results arrived at had checked exceedingly closely with the results of actual trials on the track.

Marmon Operations Include Unique Features

Automatic trolley, with synchronized electric hoists, assists in handling different sizes of bodies, expediting speed of separate assembly lines.



Dropping chassis on conveyor at Marmon plant

AT the Marmon Motor Car Co. plant all chassis go down the same general assembly line, until they are ready to receive the bodies. To expedite assembly from this point on, it has been found desirable to segregate the two larger from the two smaller chassis on different assembly lines, so that both body to chassis assembly lines can be run at the speed best suited to requirements.

From this point on, therefore, the two smaller chassis continue on down the chassis assembly line, receiving the bodies as they go along, while the two larger chassis are transferred by means of an automatic trolley to the head of another floor conveyor line for their body assemblies. This automatic trolley has two sets of synchronized electric hoists, one by the means of two hooks engaging the frame side rails near the rear, and the other hooking onto the front tubular cross-member.

All the operator on the chassis line has to do is to hook onto the chassis, pull the controls starting the hoists, and start the trolley on its way. At the head of the larger chassis conveyor there is an automatic stop for the trolley, supplemented by a hanging hand control on the trolley itself. Pulling another control lowers the chassis to the floor, on the conveyor. The hooks are so designed that they release themselves automatically when the tension is removed, so that the operator at this point merely has to pull the hoist control and another which starts the trolley on its return trip to the chassis assembly line.

An instance where carboloy boring tools have replaced diamond boring operations is illustrated in Fig. 1,

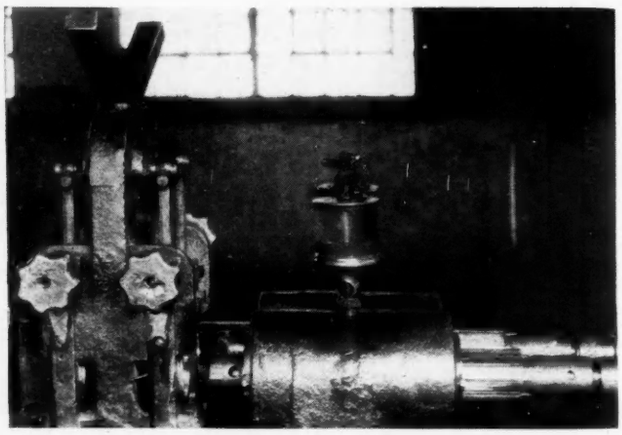


Fig. 1—Boring with carboloy at the Marmon plant

a finish machining operation on the large end connecting rod bearings for the Marmon Roosevelt engine. The machine is a specially built two-spindle horizontal boring lathe on a Chard lathe bed. Spindle bearings are hardened and ground. It will be noted that hardened wear blocks are inserted in the spindles in the form of splines. These blocks are replaceable and facilitate grinding to size. The work head comprises a four-rod two-station indexing head, one operator loading and unloading two machines during the cutting operation. Spindle speed is 600 r.p.m. A floating drive for the spindles is used, of course, part of which may be seen at the extreme right.

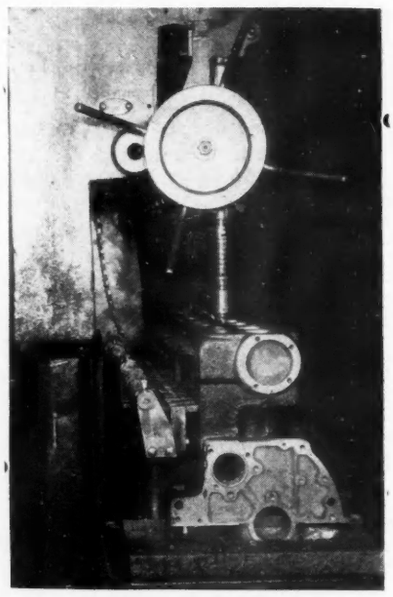


Fig. 2—Valve lapping operation

While automatic valve grinding machine tools are not new to the engine manufacturer, the installation (illustrated in Fig. 2) at Marmon has several features which recommend it. Built by Marmon, it is extremely simple in operation and fits right into the cylinder block machining and assembly line. Note the simple camshaft construction which operates the valve lifters, the latter having a spring control return. It will also be noted that there is no vertical reciprocating motion of the oscillating driving spindles. These are kept in constant engagement with the valve head, the latter being lifted off their seats by means of the cam-operated lifters, compressing springs on the telescoping driving spindles. Previous to this valve tapping operation, valve seats are hand reamed to 0.003 in. with respect to the valve guides.

Protective Coatings for *Aluminum* and *Alloys Present* Problem

Attack by agencies found in the atmosphere and its prevention discussed in paper by H. Sutton, R. A. E., before the British Electroplaters and Depositors Society.

ALUMINUM alloys are subject to attack by certain agencies sometimes found in the atmosphere, and the problem of its protection against these agencies is of particular interest to the aircraft industry. A paper on "Some Recent Developments in Protective Coatings of Aluminum and Some of its Alloys" was presented at a recent meeting of the (British) Electroplaters and Depositors Technical Society by H. Sutton of the Royal Aircraft Establishment, from which the following brief descriptions of relatively new processes are taken. Mr. Sutton stated that he had had personal experience with these different processes.

The Anodic Process.—The anodic oxidation process due to Bengough and his collaborators consists in making the article to be treated the anode in a bath of 3 per cent aqueous chromic acid solution, the voltage being raised gradually from zero to 40 in 15 min., maintained at 40 volts for 35 min., raised to 50 volts in the course of 5 min., and maintained at 50 volts for a further 5 min. By this means a protective coating of oxide is produced on all parts of the surface accessible to electrolyte.

Graphite plates have been used extensively as cathodes, and in general have given satisfactory service. It has been found possible to use clean steel plates as cathodes, or, where convenient, the tank itself, but stainless steel is preferable to ordinary steel for the purpose. A steel containing 0.10 to 0.15 per cent carbon and 12 to 14 per cent chrominum has given the best results as a material for cathodes and tanks. In the operation of the anodic process there is a tendency for the chromic acid to be reduced at the cathodes and thereby rendered useless. The amount of reduction occurring is influenced greatly by the nature of the cathodes; for example, stainless steel of the type mentioned has been found to cause less reduction than any other material so far employed.

The chloride content of the electrolyte should not be more than the equivalent of 0.02 gm. NaCl per 100 cc. in order to avoid trouble from this cause.

The anodic process can be applied to aluminum, duralumin and most aluminum alloys, but alloys containing more than 5 per cent of copper have not proved capable of being treated. Provided that reasonable care be taken to avoid scratching the film, etc., pieces can be heat treated satisfactorily after anodic treatment, but if a salt bath be used the film is likely to be injured to some extent unless the salt, usually sodium nitrate, is of fairly high purity. Attempts to treat unsuitable alloys are very injurious to the bath, since pitting and solution of the aluminum occurs. Contact of aluminum or alloy under treatment with steels prevents normal operation of the process; contact with brass results in rapid and severe attack on the brass during treatment.

The protection against corrosion afforded by anodic films is much improved by the subsequent application of suitable paints or enamel or by a grease. Lanolin has been much used for the purpose, and is probably applied most conveniently in the form of a solution consisting of white spirit, 45 per cent; solvent naphtha, 45 per cent; lanolin, 10 per cent by volume.

The Jirotka Process.—This process consists in obtaining a protective film on the surface of aluminum and certain alloys by immersion in a bath consisting of an aqueous solution of suitable salt, notably chromates and salts of the heavy metals, kept at a moderate temperature. The treatment affords considerable protection against corrosion. A very interesting aspect of this process is the variation in color of the films obtainable, suggesting considerable scope for the process in decorative work.

The Stafford-O'Brien Process.—Precise details are not available, but the process is stated to consist of anodic treatment at low voltage in sulphuric acid containing a chloride, and is a method of producing films on aluminum and aluminum alloys for protection against corrosion.

Coatings of Metallic Aluminum.—A form of duralumin having a coating of aluminum of high purity, and known as Alclad, is being produced. The coating is understood to be applied by means of a special casting process and not to the sheet as such.

Electro-deposits on Aluminum.—Nickel deposits on aluminum have proved capable of affording a fair degree of protection against corrosion, but the protection afforded is dependent upon the physical character of the deposit, since any discontinuities in the coating form seats of corrosion of the underlying aluminum. Brook and Scott observed moderate resistance to corrosion of aluminum samples having nickel electro-deposits of about 0.0001 in. to 0.001 in. thickness. H. K. Work has described methods of producing a roughened surface on aluminum and aluminum alloys by the use of etching solutions. His objection to sand-blasting is the equipment required. His nickel-plated samples bearing 0.0005 in. of nickel alone appear to have given fair results in a salt solution test, i.e., partial immersion in 1 per cent Na Cl, 1 per cent $CaCl_2$ solution. Practical experience of duralumin and aluminum plated with nickel has shown that unless the nickel deposit is moderately thick, i.e., 0.0005 in. or more, and substantially free from pinholes, the deposit may be expected to blister and to become disrupted in places.

Zinc deposits on aluminum and aluminum alloys have given promising results, and afford better protection than nickel deposits under severe conditions. In the

author's laboratory sand-blasting with fine sand has been found the most consistent and generally satisfactory method of preparing the work. Deposits from sulphate and cyanide zinc baths are being investigated for general and protective properties. At present the sulphate type of bath appears to be preferable to the cyanide type, since a higher degree of protection is obtainable by the former.

Cadmium deposits on aluminum and aluminum alloys have given promising results. Cournot considered the cyanide type of bath the best for the purpose, and obtained satisfactory results in corrosion tests. He has also reported favorably on deposits of chromium on cadmium as a protection against corrosion. In the author's laboratory cadmium deposits have given good results, particularly on aluminum alloys. Although, under marine conditions, the cadmium of the coating is removed rather quickly, it appears to leave a protective coating, probably consisting of mixed oxides of cadmium and aluminum.

Oakland Wage Incentive System

(Continued from page 579)

ment of the equation which represents the increment in bonus is only a small percentage of the first part of the equation, so that the equation becomes closely comparable to that of a piece rate. For example, beginning with point B the base wage is really 110 per cent, while beginning at point C the base wage starts at 120 per cent.

With this background we can reexamine this system in a new light. The absolute importance of the normal is now clearly indicated. If it is accidentally set too low the basic task becomes so high as to make it almost impossible to reach or exceed point A on the earning curve. On the other hand, the entire control system is so well designed and so simplified that the effect of the normal may be readily observed and its value changed according to circumstances. In a rough way the general effect on the bonus of the averaging pay periods may also be visualized. Under the conditions discussed earlier, a period immediately preceding an increased schedule may conceivably carry the earnings of the group below point A on the earning curve, and by the same token the following upward swing may carry the group above point C. In the absence of actual operating figures the real effect on this cannot be seen. However, it might be natural to assume that the rolling average may stabilize the earnings somewhere around point B or between A and B, this again being entirely dependent upon the size of the normal.

Suffice it to say at this juncture, that the operating management is thoroughly sold on the principle of wage incentive and have postulated the entire structure on the fundamental idea that these groups will respond to a real, financial incentive. And they also recognize the fact that the ultimate success depends entirely upon an arrangement which produces the promised financial reward.

Those familiar with the installation of wage incentive systems can appreciate the difficulties involved in starting a new idea of this kind. The most serious obstacle, and undoubtedly the basic reason why wage incentives for non-productive workers have not been experimented with more generally, is the real problem of setting a rational standard. Perhaps an answer will be found in this linkage of standard hours based on the direct labor payroll, although further experience may indicate the necessity for qualifying this relation in some way. Curiously enough, although the standard is rational and understandable, it demands considerable educational effort to sell the idea to the working force, because to the individual, the tie-up with the size of the direct-labor payroll is less understandable and less tangible than a tie-up with a definitely measurable quantity such as production rate, with which incentives for direct labor are usually associated.

Another negative feature which can be overcome only by educational work is the fact that this class of worker whose wage usually is a fixed quantity, assumes the view that a bonus is a definitely established thing and learns to expect it in every pay envelope. Moreover, it is difficult for him to grasp the reasons for fluctuations in the amount of the bonus, since his effort is always at high pitch, and undoubtedly it is this feature that makes it necessary to employ the device of averaging pay periods to stabilize, so far as possible, the amount of bonus payments.

Despite the complexity of the initial problem of installation this movement has gained momentum and considerable savings are predicted for the first year of operation. And finally the experience gained in this operation will be considered at a later date in connection with the formation of other groups such as general laborers, sweepers, and the maintenance force.

Ford De Luxe Models

ANNOUNCEMENT of two new Ford cars—a de luxe sedan and a de luxe coupe—is made by the Ford Motor Co.

The de luxe sedan is of the two-window Fordor type with the distinctiveness of exterior appearance and interior trimming that marks the town sedan.

Mechanically these new Ford types are the same as the other Model A cars.

Interior of Ford de luxe sedan, showing arm rests, toggles and robe rail

Just Among Ourselves

Talking to Invisible Listeners on Business

A LITTLE over a week ago we had the exciting experience of broadcasting for the first time. The performance was staged at the WMAC studios in Washington, and the broadcast went out over the Columbia network. We were one of six business paper editors who were supposed to give a waiting world an answer to the question, "How's Business."

To begin with, we resent the implication brought by many of our friends that the date of the broadcast—which happened to be April 1—had anything to do with our invitation to speak. Probably it did—but what of it?

We reached the WMAC studios about 30 minutes ahead of time to be greeted with surprise by the genial program manager, Harry C. Butcher. It seems that experienced performers rush in about 30 seconds before they are due on the air. Thus we started right off by feeling something like the farmer who gets to the station three hours before his train leaves for his first two-hour trip to the big city.

Naturally we were wondering how it would feel to deliver a talk to a little round bit of metal with wires attached. And we didn't grow any easier in our mind when—after delivering a few test sentences by request—we were told to "Speak a little louder; your voice is rather thin."

We calmed ourselves somewhat by reflecting that we were fifth on the program, and that everybody would have tuned out by that time anyhow, until we remembered that Paul Whiteman came right afterward, and that (probably) a lot of people would be tuning in early so as not to miss any of his program—a rather disquieting moment for us.

At any rate, our turn finally came and then we did the deed.

Misunderstood and Misquoted

NEXT morning a Washington newspaper quoted us as stating that "the first quarter business of the automobile industry this year had been larger than any previous year, for five years."

All of which leads us to risk making you turn away from this page at this point, by reprinting—for the sake of the record (whatever that may be)—what we actually said—or, to be more accurate, read.

* * *

So, Here is What Was Said—

"YOU radio listeners really know better than I do how good the automobile business is going to be in the next few months, because its goodness or badness depends entirely on whether or not you buy a new automobile—or at least get your old one thoroughly overhauled.

"Either way you will help to make the automotive industry prosperous—and prosperity for this largest of our manufacturing industries means much to general business health.

"Automobile production increased somewhat in Mrach, as compared with January and February, but total output for the first quarter of this year ran something like 30 per cent behind that of the first quarter of 1929.

"There is every indication that spring business this year will continue to run behind that of last year, to just about the extent that the early months have run behind last.

"Dealer stocks of both new and used cars are not showing the usual seasonal increase and thus the industry is getting into a more stable position than it has been for some time.

"The maintenance and repair end of the automobile business is going ahead faster, however, than ever before.

"Gasoline consumption, an excellent gage of automobile use, ran 35 per cent more during the first quarter this year than during the first quarter of 1929."

* * *

Four-Year Average Bettered This Quarter

"I HAVE often been asked the question lately, 'When will the automobile business recover?' *It is worth remembering that the automobile business doesn't have to 'recover' in order to register the second biggest year in its history from the standpoint of dollar volume in motor vehicle production.*

"During 1930, automobile and truck manufacturers will produce approximately $4,100,000,000 worth of motor vehicles. This is the second largest year we have ever had.

"Automobile business for the first quarter of 1930 was better than *the average for the first quarter of 1926, 1927, 1928 and 1929.* New passenger car registrations are showing a gain of about 3 per cent over the average of the first quarters of these past four years.

"The automotive industry is on its way to a year of good average business."

* * *

If You Heard— Let Us Know

INCIDENTALLY we can't help wondering whether anybody in the automobile business or any readers of this rambling page happened to be listening in. If you did, won't you just tear off this corner of this page, write your name on it and mail it to me, so that I will have a fair chance to duck next time I see you coming down the street?

—N.G.S.

Increased *Facilities* and *Business Progress* in Aircraft Industry

The extent of selectivity, characteristics of individual ships, and complete prices of world airplanes are analyzed in the Chilton Aero Directory for 1930

SIXTY-FIVE per cent of the airplanes sold on the American market are now equipped with braking devices, according to an analysis of aircraft and aircraft engine specifications presented in the third edition of the Chilton Aero Catalog and Directory for 1930, which has just been published. Classification of airplanes by the number of seats shows that 3 per cent of the planes produced in 1929 had only one seat; 18 per cent had 2 seats; 37 per cent contained 3 seats; 6 per cent contained 4 seats; 8 per cent, 5 seats; 11 per cent, 6 seats; 3 per cent, 7 seats, and 14 per cent had seats for 8 or more persons. The above figures are applicable to land planes, seaplanes, flying-boats and amphibions.

Eighty-three per cent of the airplane engines used on American units during the same period were produced by six manufacturers. Of these the leading manufacturer accounted for 35 per cent; the second manufacturer, 18 per cent; the third manufacturer, 13 per cent; the fourth manufacturer, 8 per cent; the fifth, 5 per cent, and the sixth, 4 per cent. Seventeen per cent remaining were produced by all other manufacturers of airplane engines combined.

The price range from $695 to $5,000 included 37 per cent of planes produced. Twenty-six per cent fell in the class from $5,000 to $10,000; 18 per cent were priced from $10,000 to $15,000, and 19 per cent from $15,000 to $90,000.

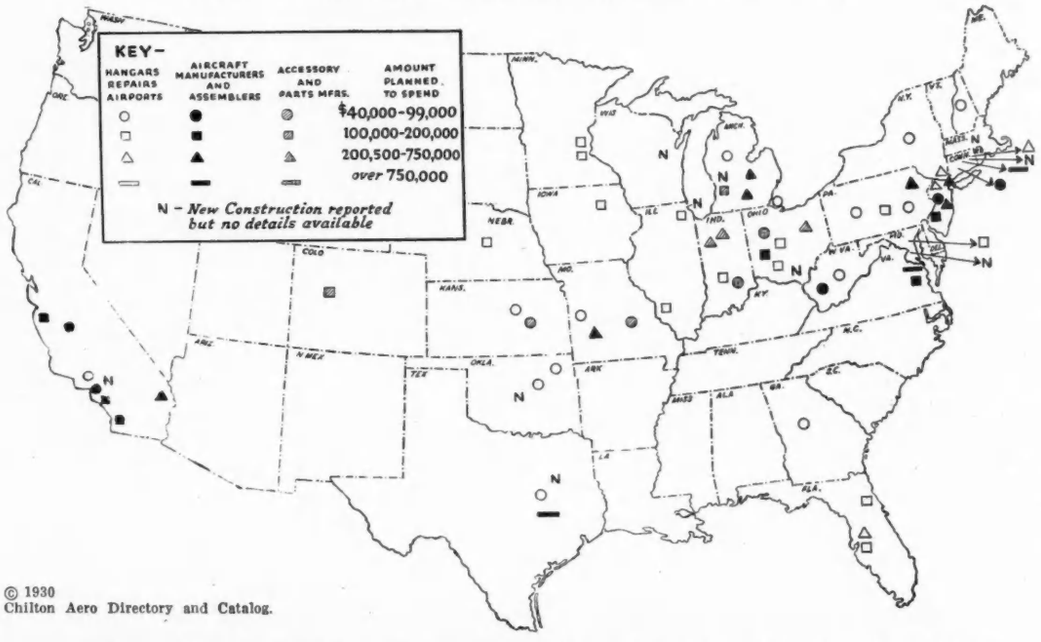
Wings of 90 per cent of the planes produced are wired for lights. Six per cent are not wired, and wiring is optional on the remaining 4 per cent. Seventy-two per cent of the propellers used are steel, or metallic alloys, while 28 per cent are of wood.

Wing structure on 91.5 per cent of present planes is of wood, and 8.5 per cent of duralumin. Wing covering is fabric on 86.2 per cent, plywood on 6.5 per cent, and duralumin on 5.3 per cent. Fuselage construction is of welded steel tubing on 80 per cent, of duralumin on 12 per cent, and of wood on 8 per cent.

Forty-two per cent of the airplanes now being constructed are of the open land biplane type, and 37 per cent of the cabin monoplane type. Open land monoplane types account for 9 per cent of the present production, while flying boats, amphibions, and seaplanes as a class, and closed land biplanes as a class each account for 6 per cent.

Analysis of aircraft engine specifications based on approximately 50 models for which equipment and

New Construction for Aeronautical Activities



This map locates, classifies and measures activity at the airports in the United States and by aeronautical manufacturers

of the Average *Airport* Marks

material data were available shows that 5 per cent of the engines produced fall into a price class of $1,000 or below. Sixty-two per cent were priced in the range from $1,000 to $5,000, and 33 per cent were priced above $5,000 up to a maximum of $35,000.

Division of engines according to the number of cylinders shows that 10 per cent had 4 cylinders, 12 per cent had 5, 4 per cent had six, 18 per cent had seven, 4 per cent had eight, 24 per cent had nine, 24 per cent had twelve, and that 4 per cent had other multiples not included in the above classification. Cylinder construction was of steel-lined aluminum on 66 per cent of these engines, of steel on 11 per cent, of cast iron on 7 per cent, and of monel metal, nickel, and other alloys on 16 per cent of the remainder.

Eighty-eight per cent of the engines have direct propeller drive, and 12 per cent have some form of intermediary gearing. Ignition on 90 per cent is of the magneto type, and battery ignition is used on 10 per cent. Sixty-nine per cent of the engines are not equipped with an exhaust manifold.

Considering the engine auxiliary units, 65 per cent of the carburetors are produced by one leading manufacturer, 28 per cent by the second manufacturer. The remaining 7 per cent is divided among three manufacturers, two of which are foreign.

Seventy-four per cent of the engines produced are air-cooled, and 26 per cent water-cooled. Seventy-four per cent of the engines are equipped with only one carburetor, 23 per cent with two, and 3 per cent with three.

Fifty-eight per cent of the spark plugs are produced by one leading manufacturer, 25 per cent by the second manufacturer, 5 per cent by the third, and the remaining 12 per cent by a number of manufacturers including the engine makers themselves. Seventy-eight per cent of the engines have one exhaust valve per cylinder, and the remaining 22 per cent has two.

Thirty-nine per cent of airplane engines are equipped with starters manufactured by one company, and 16 per cent with those of a second maker. Nineteen per cent are not equipped with starters, nine per cent furnish them as optional equipment, 14 per cent use their own make, and three per cent are accounted for by a third trade-marked brand.

Ignition units for 67 per cent of the engines are made by one manufacturer. A second manufacturer accounts for 11 per cent, a third and fourth for eight per cent each, and a fifth for 6 per cent.

The analysis of aircraft and aircraft engine specifications was prepared by the Chilton Aero Catalog and Directory from detailed specification of planes and engines collected and tabulated by the Specifications Department of the Chilton Class Journal Co.

A count of aircraft trade outlets, including wholesalers of aircraft parts, supplies, tools and equipment, distributors and dealers in airplanes, service and repair shops specializing in airplane business, operating companies, scheduled and non-scheduled, schools and airports, shows that there were 2893 units of this type in operation as of January, 1930. These trading units were divided as follows: Wholesalers, 949; distributors, etc., 865; service units, 571; operating units, 957; schools, 758; airports operating, 1263. Figures on airports and schools are based on figures of the Aeronautics Branch, Department of Commerce, those for dealers and other trade outlets, were collected by the Direct Mail Department of the Chilton Class Journal Co.

The Aero Directory

THE Chilton Aero Catalog and Directory was first published in 1911 as the Chilton Aero Directory. The only copy of the original edition known to exist is in the possession of Major Ernest L. Jones, formerly chief of the Communications Section, Aeronautics Branch, Department of Commerce. Publication of the directory was resumed in 1929, and the 1930 edition has just been published by the Chilton Class Journal Co.

The years intervening between 1911 and 1929 saw most of the groundwork accomplished in the establishment of the aviation industry as one of the great factors in world transportation, now warranting the publication of a great separate commercial guide and reference book such as the Chilton Aero Catalog and Directory. The present edition of the work contains specifications on the airplanes and engines of the world, in addition to marketing and reference data of value to airplane manufacturers, distributors, and operating agencies. Many of the features contained in it are believed to have been never before published. Included in the last category is a list of foreign manufacturers of equipment and accessories, and servicing specification for the leading American engines. Extensive foreign distribution of the catalog is planned and with this in mind, all the products listed in the classified directly section have been listed in French in a separate index.

The increase in facilities and business at the "Average" airport is graphically illustrated from the following compilation, which was arrived at by striking an average for a number of typical airports in various parts of the United States.

As of December, 1929, the average airport has 27,500 sq. ft. of hangar space, an increase of 800 per cent over 1928, using the same airports for a basis of figuring. This did not include an average of 20,000 sq. ft. of hangar space in course of construction. The average airport registered an increase of traffic of 310 per cent comparing 1929 with 1928. The average number of privately-owned airplanes stored at the port in December, 1929, was 14, an increase of 120 per cent over 1928. The average number of training planes in use was 7, and the number of planes used for demonstration and other commercial purposes, 13, an increase of 175 per cent.

The increase of business of commercial concerns operating from the airport was 94 per cent in 1929, as compared with 1928, and the increase in spectator attendance 117 per cent. The average amount to be spent in the improvement of the airport in 1930 was $130,000.

A classification of airports shows that there is a total of 1569 now in operation, and 1272 proposed or in the course of construction.

Variable *Automatic* Transmission by the *Spontan Company* of

Unit is based on inertia-weight principle. Control of car is maintained through single pedal, which governs forward, reverse and braking mechanism.

A CONTINUOUSLY variable automatic transmission based on the inertia-weight principle has been developed in Sweden by the Spontan Company of Stockholm, the inventor being Dr.-Eng. F. Ljungstrom, whose name is well known in connection with steam turbines. The Spontan Company some time ago opened offices in the New York Central Building in New York City and is demonstrating the transmission as applied to different cars.

Probably the most important advantage of this transmission is that it greatly simplifies the operations required in controlling the car. Starting and stopping of the car, reversing and application of the brakes are all effected by means of a single pedal. When this pedal is in the released position the car is at rest or comes to rest. When it is desired to start the car, the pedal is depressed, and the farther it is pressed down the higher will be the speed. However, the speed with which the pedal is depressed does not affect the rate of acceleration. When the pedal is completely released the brakes are applied automatically. To reverse the direction of motion the control pedal, which is provided with a sort of stirrup, is pulled slightly upward from the released position. If after running backward it is desired to move forward again, the pedal is pulled up once more.

Another advantage of the Spontan transmission is that with it there is no interruption in the acceleration of the car due to gear-shifting, and the car therefore can be brought from a standstill to any given speed in a shorter period of time. Unpleasant shocks due to engaging the clutch too rapidly also are eliminated. It is said to be impossible to stall the engine by depressing the pedal too rapidly. Finally, the transmission includes what is known in this country (in connection with its bicycle applications) as a coaster brake or what the British refer to as a "free wheel." On down grades of any importance the control pedal is released, causing the engine to idle and resulting in a saving of fuel.

The principle of operation of the Spontan transmission will be explained with the aid of a number of diagrams and sectional drawings. Referring to Fig. 1, the transmission comprises two bob weights which connect to studs secured into the web of the engine flywheel by means of links or connecting rods. The bob weights are rigidly connected with two eccentric straps surrounding two eccentrics mounted on what is known as the main driving sleeve. The eccentrics which are spaced 180 deg. apart or opposite each other, are of the ball-bearing type, steel balls being inserted in a raceway between each eccentric and its strap. From the main driving sleeve the motion is transmitted to the propeller shaft by means of a special design of one-way clutch or overrunning clutch, of which details will be given farther on.

The bob weights, of course, rotate with the flywheel around the axis of the engine crankshaft and therefore are subjected to centrifugal force. This force acts radially outward from the crankshaft axis, and in Fig. 1 is represented by the line C. A component of this force, C sin α, acts transversely to the line of centers of the eccentric. The eccentricity of the eccentric is e/2 and since there are two of the bob weights, the moment which they impose on the eccentrics and on the main driving sleeve is C e sin α. The maximum value of the turning moment is therefore Ce, and if the resisting moment on the eccentrics is less than this the eccentrics will turn with the bob weights and the fly-

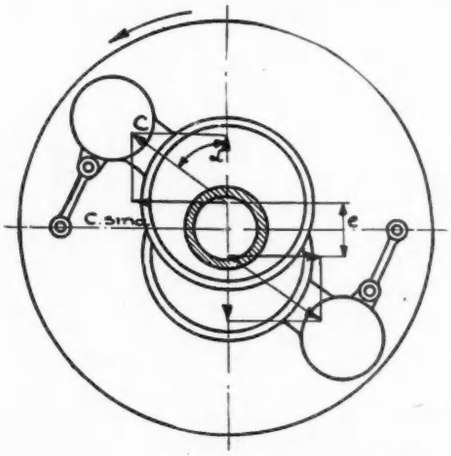
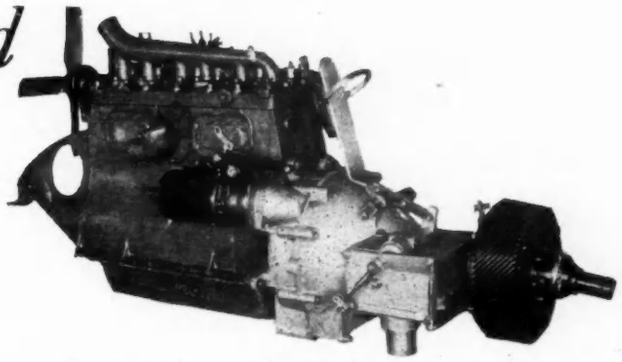


Fig. 1—Diagram showing inertia weights and eccentrics of Spontan automatic transmission

Practical Test

THE writer of the accompanying article had an opportunity of driving a car fitted with the Spontan transmission and found its control very easy to master. With the ordinary control there are three pedals to be actuated by two feet, while with the Spontan transmission there is only the single control pedal, which gives all gradations of forward speed, allows the car to coast, applies the brake and even reverses the direction of motion. Aside from the fact that in order to make a quick stop one must release the pedal instead of pressing down on it, there is really nothing to learn regarding the operation of a car with this transmission.

Has Been *Developed* Sweden



Essex engine fitted with Spontan transmission

By P. M. HELDT

wheel, and the drive is direct. Any variations in the resisting torque within this limit will result in a corresponding variation of the angle α.

Now assume that the car is at rest, the control pedal being released, so that the brakes are set and the engine is idling. The bob weights are subject to centrifugal force the same as before, though on account of the lower speed of rotation this force is smaller. In this case, however, since the bob weights rotate around the eccentrics, the moment on the eccentrics changes in direction twice during every revolution. Assuming a uniform speed of rotation, the centrifugal force of the bob weights is constant and the moment varies as the sine of the angle α, between the radial line through the center of the bob weight and the line of centers of the eccentric. This means that the moment can be represented by a sine curve as in Fig. 2. How this alternating moment is converted into a unidirectional moment on the propeller shaft may be best explained by reference to Fig. 3, which is a sectional view through part of the roller clutch employed for "rectifying" the torque. Sections of three concentric sleeves are shown, the middle one being the main driving sleeve on which the two eccentric sheaves are mounted, the inner one a driven sleeve fastened to the propeller shaft, and the outer one a "reaction sleeve" on which the reverse torque is taken up.

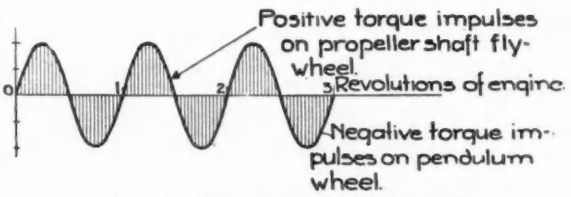


Fig. 2—Starting-torque impulses

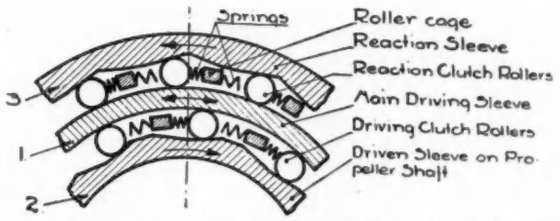


Fig. 3—Diagram of double roller ratchet clutch

The principle of the roller clutch is generally understood. The rollers are held by means of a cage and springs between a cylindrical surface and a flat surface in such a way that when the part with the cylindrical surface is turned in one direction the rollers are wedged between the two surfaces, whereby the corresponding parts are coupled together, whereas when that part is turned in the opposite direction the two parts are freed of each other. The springs really always hold the rollers in contact with both surfaces, so that when the cylindrical part turns in the proper direction the coupling action takes place instantly and there is no lost motion. By referring to Fig. 3 it will be seen that the two roller clutches are arranged to be engaged by opposite directions of motion of the main driving sleeve. Under the conditions of operation here considered, this sleeve has an oscillating motion; while moving in one direction its torque is transferred to the driven sleeve on the propeller shaft, while when moving in the opposite direction, its torque is transferred to the outer sleeve, the reaction sleeve.

It might be inferred from the above that the torque impressed upon the propeller shaft is very non-uniform, for not only do the driving impulses vary between zero and the maximum, but successive impulses are separated by a time interval equal to the period of one impulse. This is provided for by fitting the driven sleeve with a flywheel, which evens out the pulsating torque as shown in Fig. 4. This flywheel also serves as the transmission brake drum. The impulses which cause the roller clutch to engage the driven sleeve are referred to as positive impulses. The other, negative impulses, cause the main driving sleeve to engage the reaction sleeve. This sleeve is normally held in a definite angular position by means of a series of coiled springs which extend radially between lugs on the sleeve and on the inside of the transmission housing. These springs are under tension and they tend to bring the two lugs to which they are connected into the same radial line.

When torque is impressed upon the reaction sleeve, this sleeve is rotated around its axis, whereby the springs are extended. The reaction sleeve is fitted with a pendulum wheel which when the reaction sleeve is gripped by the roller clutch is set in motion. During this part of the torque cycle, energy is stored up in the coiled springs which give it out again during the following positive phase of the torque cycle.

In the latest design the reaction sleeve is in line with and of the same diameter as the driven sleeve, the driving sleeve extending through the inside of both. This arrangement has certain advantages over the one here illustrated.

The Spontan transmission also embodies the feature of a back-lock device which prevents the car from

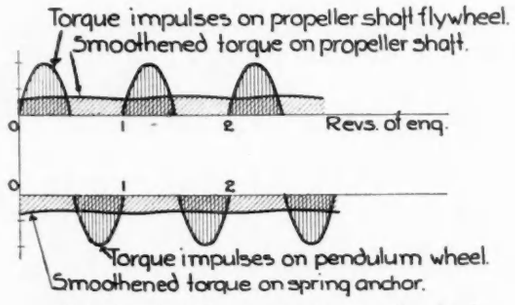


Fig. 4—Smoothening action of flywheels

running backward when stopped on an up-grade. As soon as the car starts to back up, the driving sleeve on the propeller shaft is coupled to the main driving sleeve by its roller clutch, and the main driving sleeve in turn is coupled to the reaction sleeve by its roller clutch. The reaction sleeve is held from rotating by the radial springs, hence the car cannot run backward under these circumstances.

This explanation of the action of the transmission applied to the case where the car is stationary because the torque developed by the transmission is less than that required to move it. Now suppose that the brakes are released. Upon the throttle being opened by depressing the control pedal the engine speeds up. The centrifugal force on the bob weights increases at the same time, but much faster, as the square of the speed, hence the torque impressed upon the main driving sleeve soon becomes sufficient to turn the sleeve and start the car. At the beginning of car motion the sleeve does not turn uniformly but intermittently. During periods of positive torque the driven sleeve turns with the main driving sleeve, while during periods of negative torque, it remains stationary. The result is that the periods of negative impulses are shorter than the periods of positive impulses. The two kinds of impulses are then unequal as shown in Fig. 5.

When a negative impulse is followed by a positive one the main sleeve must be brought from rest to the angular velocity of the driven shaft before the inner clutch can transmit torque, and owing to the inertia of the sleeve the action of the clutch is somewhat delayed. Similarly, at the beginning of a negative impulse no torque can be transmitted to the pendulum wheel until the sleeve has come to rest. Therefore, as shown in Fig. 5, there are two periods in each revolution during which no torque is being transmitted.

Fig. 6 shows the torque impulses acting on the propeller shaft flywheel for a given speed ratio and the smoothening action of its inertia, the slightly undulating curve representing the torque beyond the flywheel. The engine torque is also plotted (light, straight line) and the difference between the propeller shaft torque and the engine torque represents the increase due to the action of the inertia weights. This additional torque is made possible by using a stationary reaction point on the inside of the transmission housing.

As the car increases in speed, the positive impulses become longer and longer, until finally the gear automatically changes over to direct drive, which occurs when the resisting torque on the propeller shaft decreases to the torque the engine crankshaft for the particular throttle setting.

As long as the transmission is in direct drive, the eccentric straps do not revolve on the eccentrics. The main sleeve then occupies such a position relative to the crankshaft that the torque impressed on the propeller shaft is equal to the resisting torque in it. Variations in the resisting torque are compensated for by automatic adjustment of the main drive sleeve relative to the crankshaft, a moderate increase in resisting torque causing the main drive sleeve to lag behind the crankshaft, thus increasing the leverage of the centrifugal forces on the bob weights till the torque impressed on the propeller shaft is again equal to the resisting torque. If the increase in the resisting moment is considerable the bob weights will start to revolve on the sleeve and the drive becomes indirect.

As long as the drive is direct, there is a "free-wheeling" action at the outer clutch and the pendulum wheel therefore is out of action.

A curve of propeller-shaft torque obtained with the Spontan transmission is shown in Fig. 7. The curve

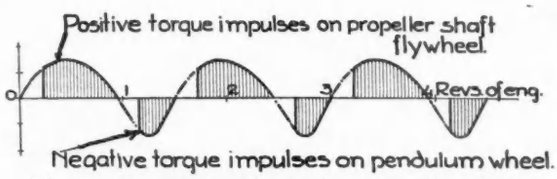


Fig. 5—Torque impulses when propeller shaft is running at one-half engine speed

will be seen to be composed of two sections, that at the right corresponding to direct drive, for which the propeller shaft torque is directly proportional to the crankshaft torque. The part of the curve at the left corresponds to indirect drive, the torque then increasing rapidly as the speed of the car decreases owing to the change in transmission ratio. The change-over from direct to indirect drive takes place at a lower speed than the change in the opposite direction. This is due to the fact that after a period of operation in direct drive, the bob weights are at rest in their outermost position, and before they can be set in motion again the force necessary to overcome the centrifugal force acting upon them in this position must be supplied by the engine.

It remains to explain how the reverse is effect-

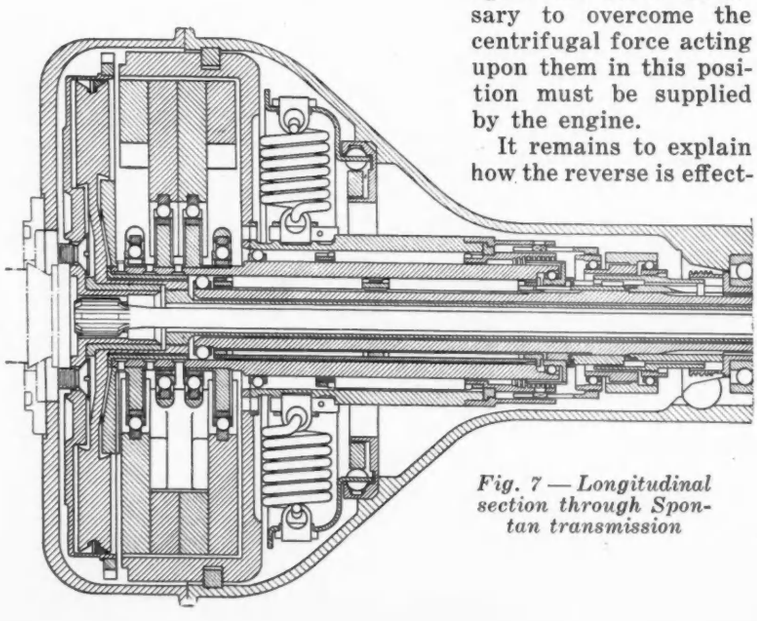


Fig. 7 — Longitudinal section through Spontan transmission

ed with this transmission. By referring to Fig. 3 it will be seen that the driven members of the roller clutches have two sets of inclined surfaces facing in opposite directions. Normally the rollers are in contact with the surfaces facing in one direction. By shifting them so they are in contact with the other set of surfaces, the direction of transmission of the roller is reversed. For the purpose of reversing the rollers are carried in cages, which can be turned around their axis by the driver by means of the single control pedal. As already explained, to reverse the driver raised the pedal slightly from its released position.

On cars equipped with the Spontan transmission the brakes are applied by means of a powerful spring. They are therefore always on when no pressure is being exerted on the control pedal. Pressing down on the pedal immediately releases the brakes and a further depression causes the throttle to open. The

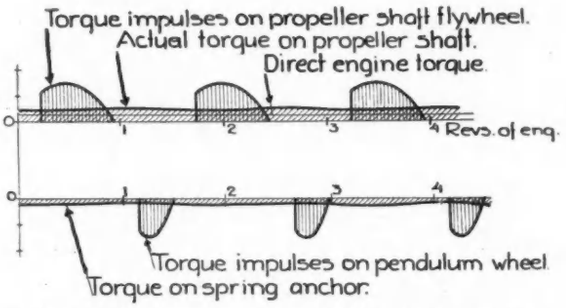

Torque impulses on propeller shaft flywheel.
Actual torque on propeller shaft.
Direct engine torque.
Revs. of eng.
Torque impulses on pendulum wheel.
Torque on spring anchor.

Fig. 6—Various torques, propeller shaft running at one-half engine speed

spring is so hooked up that its effect on the pedal gradually lessens with the pedal motion, but it remains active for all pedal positions, so that the pedal will always return to the neutral position whenever the pressure on it is removed. To make it possible to release the brakes for moving the car around in the garage without getting into the seat, a special brake release lever is provided which can be manipulated from the outside.

Nearly a dozen of these transmissions have been built up to date, and three of them have been brought to this country. The photographic illustration repro-

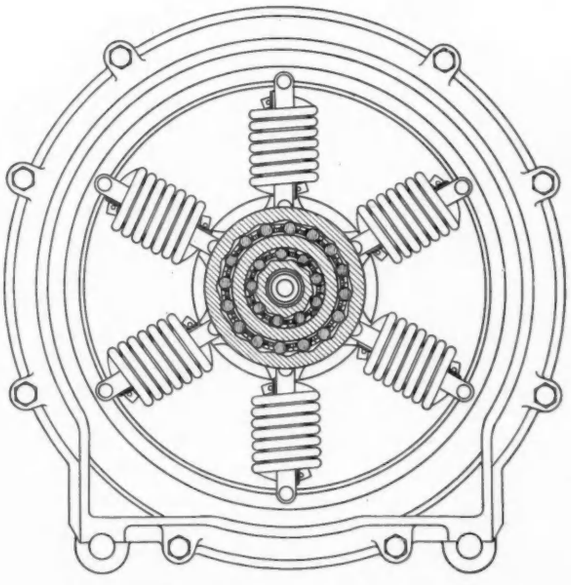
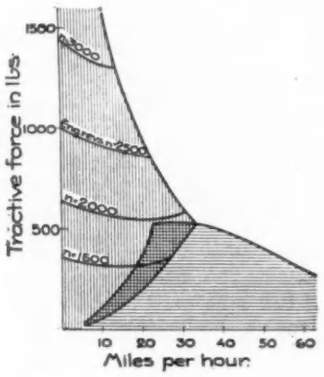


Fig. 8—Cross section through transmission

Fig. 9—Graph of tractive force on road wheels for a car with Spontan transmission having an engine of 222 cu. in. displacement and a rear axle ratio of 4.88 to 1



duced herewith shows the transmission applied to an Essex Super-Six engine. One of the transmissions has been in use on a taxicab in service in Stockholm for a considerable period and is said to have given entire satisfaction. It might be pointed out that the action of the transmission differs from that of the ordinary transmission only when the "gear ratio" is changing, and especially during periods of rapid acceleration, hence its advantages are realized most completely in services where frequent starts and stops are required.

Steel for Permanent Magnets

THE influence of carbon and molybdenum on the magnetic qualities of iron has been investigated by Messrs. Stogoff and Messkin, who report their results in Stahl und Eisen. Two series of steels were investigated, one with a carbon content of 1.47 per cent and molybdenum contents varying between 0.16 and 4.448 per cent; the other with 2.57 per cent of molybdenum and carbon contents varying between 0.65 and 1.31 per cent. These steels were compared with 0.8 per cent carbon steel and ordinary tungsten magnet steels.

The steels were melted in the crucible. The ingots were reduced to square section rods of $\frac{5}{8}$ in. These were heated to 1000 deg. C. (1832 deg. F.) and allowed to cool slowly for 24 hours. Specimens measuring 0.40 by 0.40 by 8 in. were quenched in oil or in water after heating in lead.

The results showed that the best steel of the two series contains between 0.90 and 1.07 per cent of carbon and between 2 and 2.5 per cent of molybdenum. It was quenched in water at 800 deg. C. (1472 deg. F.). The remanence then was 10,680 gauses and the coercive force 76 gauses.

The magnetic qualities of this steel are greatly superior to those of ordinary magnet steels or tungsten steels. The loss of magnetism with age is substantially the same as with the latter. The molybdenum content being small, the cost of these steels is less than that of the usual chromium and tungsten magnet steels, while the machining qualities are about the same.

IN the course of an address given before the Society Chemical Industry at the Birmingham Chamber of Commerce in England, E. J. Dobbs emphasized that chromium is no protection to metals such as brass, copper and nickel-silver, and explained that the deposit tended to accelerate corrosion of these metals through the formation of a strong battery in the presence of moist atmospheres, with consequent corrosion of the base metal.

Chronological History of *Automotive* Shows *Regular Annual* Progress

SINCE its inception in 1892, when the first gasoline automobile was built, almost every year of the 39 years of progressive development is marked with an outstanding "first" in the automotive industry. During the first six years (1892 to 1898) progress was slow, but after the public became interested (Winton's first delivery of a car to a purchaser in 1898), development was rapid, and each 12 months thereafter was marked by some historical introduction of engineering, production, accessory or distribution feature of worth, until the war years of 1916 and 1918.

The accompanying table gives the dates of the most important happenings in the development of the automobile in this country and of the introduction of the more important features in automobile design. The origin of different practices in design in many cases is somewhat indefinite. Any new device or practice is first conceived by the engineer or inventor; it is then embodied in the form of a model and finally it is incorporated in regular production vehicles. These different stages naturally are reached at different times. In the preparation of the table an endeavor has been made, unless otherwise stated, to show the year during which any given feature was first incorporated in cars that were sold to the public. Of course, no table of this kind can ever be complete, but it is believed that most of the major historical events of lasting interest and most of the important features of present-day car construction and design are included.

1892—First gasoline automobile built in the United States (Duryea).

1895—First public automobile contest in the United States (Times-Herald race, Chicago).

1898—Aluminum alloy first used for automobiles (Haynes).
First gasoline car delivered to purchaser (Winton).
Nickel-steel used for axles and other parts (Haynes).
Electric cabs placed in service in New York.

1899—First public garage and repair shop opened in New York.

1900—Automatic spark advance used (Mercedes, Packard, Olds).
Automobile speedometer placed on market by Joseph W. Jones.
First front mounted powerplant in United States (Columbia).
First New York automobile show (old Madison Square Garden).
Wheel steering introduced in American practice (superseding tiller steering).

1901—Shaft drive introduced.
First automobile endurance contest (New York-Buffalo).
Rear-entrance tonneau-type of body introduced.
First law regulating automobile traffic (Connecticut).

1902—Chrome-nickel steel in automobile construction.
High-speed tool steel (tungsten steel) in automobile manufacture.
Divided front seats or bucket seats for runabouts made their appearance.
First four-cylinder engines in regular production cars in America (Locomobile).
Three-point support for powerplant introduced (Marmon).

1903—First pressed steel automobile frame made in America (by A. O. Smith Co., for Peerless racer).
Radiators were first placed at front of engine space in American practice.
Glass windshields (glass fronts) made their appearance.
Canopy tops came into use.
Anti-skid chains introduced (Parsons, Weed).

1904—Side entrance tonneau body superseded rear entrance type.
Shock absorbers were brought to America from France by E. V. Hartford.
Automatic carburetors first fitted in American practice.
First straight-eight engine used in a racing car (Peerless).
Blower cooling introduced (Frayer-Miller).
Engine lubrication under pressure (Pierce-Arrow).

1905—First magnetos for automobile ignition made in this country by Remy Brothers.
Beginning of the era of the high-wheeled motor-buggy-type of car which lasted for several years.
Folding tops, then generally known as cape-cart tops, became regular equipment.
Universal rim introduced by Goodyear.
Annular ball bearings placed on American market (Hess-Bright).
Universal rim taking either clincher or straight side tire introduced (Goodyear).
Sleeve-valve engine (Knight) invented.
Six-cylinder engines introduced for stock cars (National).
Ignition locks first used.

1906—Direct high-tension magnetos introduced on American market (Bosch).
Drop frame (single drop at rear) introduced (Peerless).
A spring bumper, the forerunner of the present-day bumper, was developed by Ray Harroun.
Vibrator-type horn introduced.
Woven asbestos linings for brakes (Raybestos).

1907—Air brakes and air clutch-control (now used on large buses) first used on four-cylinder Northern passenger car.

Development

The Multi-Guide

THIS tabulation of the first uses of mechanical appliances and accessories in the automotive field in the United States will appear in the Chilton Automotive Multi-Guide, 25,000 copies of each issue of which will be distributed to repair shops, retailers, wholesalers and large fleet operators throughout the United States and Canada. The publication will contain about 700 pages, full of well-tabulated essential information, nowhere else obtainable within the covers of a single volume.

Taximeter cabs or taxicabs made their appearance in New York.

Vanadium steel was introduced in automobile construction (Ford).

Demountable rims (Firestone).

Magnetic-drag-type speedometer (Warner).

1908—Motor-driven horns introduced (Klaxon).

Cars with sleeve valve engines put into production (Daimler-Knight).

Silent (toothed) chains were first used for front drives of production cars (Knight).

Integral-cylinder-and-crankcase construction (Ford).

Left-hand steering (Ford).

1909—Bakelite placed on market.

1910—Torpedo-type (four-door) open bodies became the style.

1911—Electric starter introduced (Delco, on Cadillac).

Transversely split detachable rims introduced.

Phenol-condensation-product gears for front-end drives.

1912—Engine temperature indicator (Boyce Motometer) placed on market.

Spiral bevel final drive adopted by Packard.

1913—Wire wheels of the triple laced type first placed on American stock cars.

Bendix drive developed.

Beginning of the cyclecar era, which lasted only a few years.

1914—Eight-cylinder V engine introduced by Cadillac.

Vacuum fuel feed was developed by Stewart-Warner Speedometer Corp.

Thermostatic water circulation control (Cadillac).

1915—Aluminum alloy pistons for stock cars.

Self-locking differential (M. & S.)

First twelve-cylinder car (Packard).

Lanchester torsional vibration damper first used in American practice (Packard).

1917—Wood wheels with steel felloes.

Steel disk wheels (Budd).

1919—Electric vaporizer in carburetor (Franklin).

1921—Hydraulic brakes (Duesenberg).

Cobalt-chrome steel and high-tungsten steel for automobile exhaust valves (Rich Tool Co.)

Molybdenum steel in automobile construction (Wills Ste. Claire).

First straight-eight stock car on American market (Duesenberg).

First use of four-wheel brakes on American stock cars (Duesenberg).

First overhead camshaft engine for stock cars (Duesenberg).

1922—Silicon-Chrome-steel for exhaust valves (Thompson Products, Inc.).

Nickel plating of radiator shells, lamp covers, etc., became very popular.

1923—Balloon tires made their first appearance in this country.

High-pressure chassis lubrication was introduced (Alemite).

Lacquer finish for automobiles (Duco).

Ethyl fluid, the gasoline dope, was introduced.

Air cleaners on automobiles.

1924—Oil filters for the crankcase oil first fitted to stock cars (Purolator on Chrysler).

Vibration damper in clutch introduced (Franklin).

1925—Electric transmissions for buses came into use in this country.

1926—Hypoid gear drive (Packard).

Safety glass in automobile body construction (Stutz).

Centralized chassis lubrication system (Bowen on Chandler).

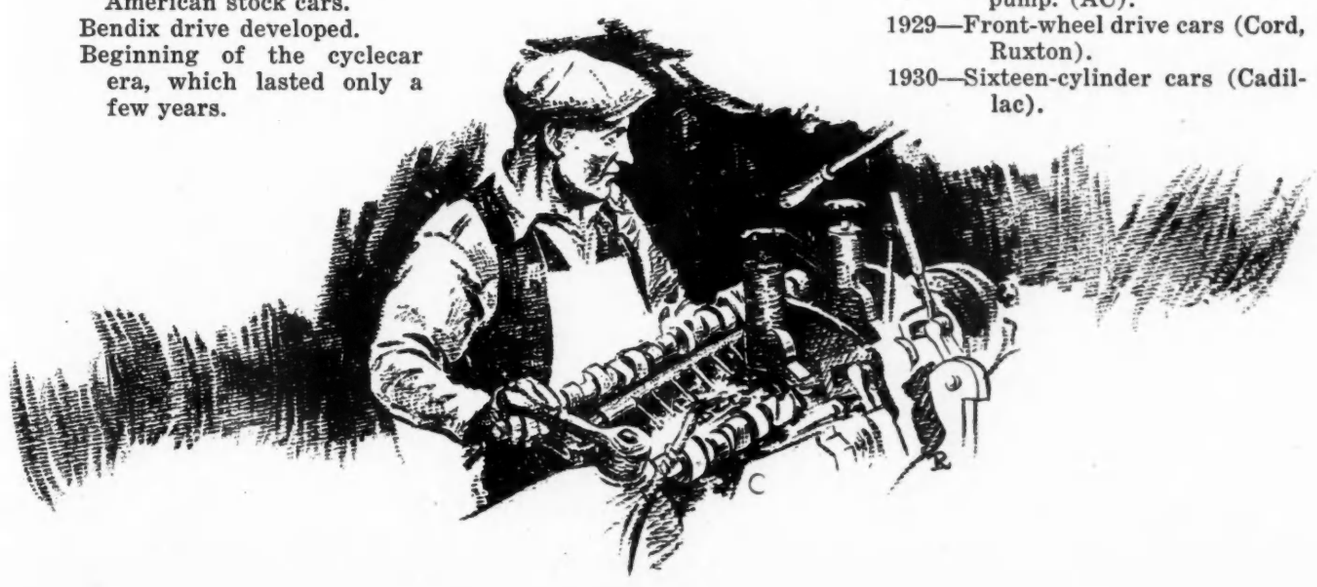
1927—Chromium plating for automobile parts introduced.

Four-speed internal gear transmission introduced (Warner Hiflex on Paige).

1928—Fuel feed by mechanical pump. (AC).

1929—Front-wheel drive cars (Cord, Ruxton).

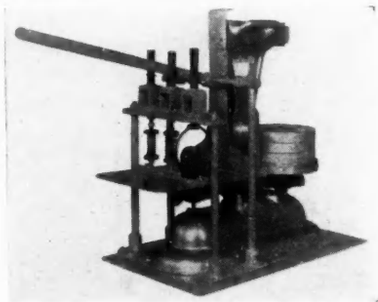
1930—Sixteen-cylinder cars (Cadillac).



NEW DEVELOPMENTS—Automotive

Valve Spring Scale

A SCALE for measuring compression pressure of valve springs has been brought out by the Exact Weight Scale Co. of Columbus, Ohio. This scale, it is stated, measures compression pressure, eliminating flex and torque actions on the spring. The scale indication is only taken from one point on the dial which is so positioned that the spring at this point is in perfect alignment with its horizontal spring bosses.



Valve spring compression scale made by the Exact Weight Scale Co.

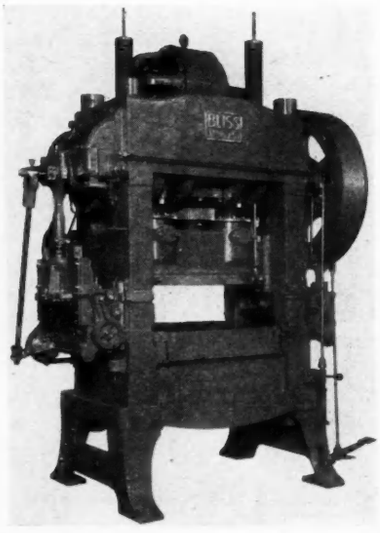
The accompanying photograph illustrates a scale of this type equipped for checking two sizes of valve springs and also piston ring tension. In calibrating the scale for any particular spring, a sleeve of the correct compression length is inserted in place of the spring, the lever pulled down and weights added to the counterbalance scale to make the pointer show exactly on dead center. The fittings on the plunger, of course, are adjusted to the correct length.

This scale can be obtained either with sealed weights or with the dial graduated to show tolerances.

Double-Eccentric Press

DESIGNED for progressive die work with ample room for long follow dies, the new No. 675 double eccentric high production press has been added to the line of the E. W. Bliss Co., Brooklyn, N. Y. It has a maximum capacity of 125 tons and is capable of operating at 150-250 strokes per minute.

To maintain rigidity at high operating speeds the double eccentric shafts on these machines are supported right up to the one-piece ball joint connections. Rigid support is given to the double eccentric shaft and the slide by a long center main bearing and deep ribbed crown. The high speed, double roller grip feed is said to be accurate and serviceable. When furnished for feeding strip stock it is equipped with a mechanical starting gage, operated by a treadle, so that the operator's hands are free to guide the strips. With this device the rolls will automatically feed a full stroke into the dies at the beginning of strips, thus eliminating a source of cutting half blanks, burring of stock and punch breakage. This mechanism is said to make possible uninterrupted feeding of strips for practically continuous production.

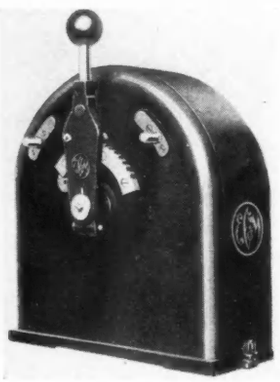


Bliss double-eccentric press

Standard bolster size is 27 in. front to back by 35 in. right to left with 8 in. maximum shut height for the die. The standard strokes are 1 in. and 1½ in. Floor space 62 in. front to back by 88 right to left. Approximate net weight 15,000 lb.

N T Master Switch

THE type N T Master switch, designed to regulate the control circuits of a magnetic contactor controller, for use on cranes, hoists, ore bridges, steel mill machinery, and other applications where full speed control is required, has been announced by the Electric Controller & Mfg. Co., Cleveland, Ohio. It is built to give a maximum of six (6) points of speed control in each direction with overload reset at the "off" position. Master switches for 4, 5 and 6 points of speed control are identical, the only difference being the location of the arm stops.



N T Master switch

The design of this switch is said to incorporate refinements insuring smooth and easy operation. Almost frictionless operation is said to be obtained through the use of ball bearings, the short throw of the operating handle, the absence of gears, and the fact that the contact fingers always ride on uninterrupted plane surface. The width has been made as small as possible so that several of these switches may be mounted in a crane cage, within convenient reach of the operator. Other features are the straight line lever operation; the short throw of the handle, and the fact that this switch can be mounted in an upright or inverted position which permits close grouping.

Thermal Ice Indicator

ONE of the greatest dangers that beset long-distance flights over water is the possibility of ice formation on the wings of an airplane. A device which may find application as an indicator of the temperature range in which ice may form on an aircraft has been developed by the Bureau of Standards. It is essentially a temperature-actuated switch which controls a red light on the instrument board of the airplane. The thermal switch is located on a strut or otherwise exposed in the free air stream, while the indicator is installed in a convenient place in the cockpit. The light, behind the rear window, appears only at—4 deg. to zero Centigrade, which according to tests made by the Na-

Parts, Accessories and Production Tools

tional Advisory Committee for Aeronautics is the critical ice-forming temperature range. This indicator warns the pilot the moment his ship has entered the temperature level at which the clear, dangerous type of ice may form.

Wilson Flexible Control

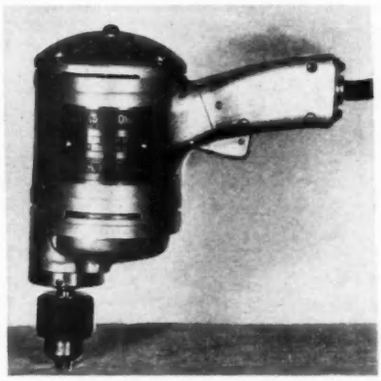
A FLEXIBLE wire control that permits of transmitting motion positively in both directions has been placed on the market by the Wilson Steel Products Company of Forty-ninth St. and Southwestern Ave., Chicago. It is a development of what is known as the

Arens flexible control for engine chokes, etc.

Arens control for aircraft, and consists of a wire-wound steel wire extending through a flexible metallic tube. At one end there is the familiar type of push-and-pull knob as commonly used for operating the choke on automobiles, while at the other end suitable fixtures can be used to anchor the tube to a stationary part and connect the wire or cable to the operating device. One of the prominent makers of outboard marine motors has adopted this control for the choke, we understand.

Clark Portable Drill

WITH a drill capacity of ¼ in. in cast iron or steel, the No. 000 U Wonder Drill recently placed on the market by the James Clark, Jr., Electric Co., Inc., Louisville, Ky., is suggested for use in aircraft and body operations. It is designed for close quarters, being only 7½ in. long overall. A special clutch arrangement is said to prevent stalling and overloading. No-load speed 2000 r.p.m., full-load speed 1200 r.p.m. Net weight 4½ lb.



Clark wonder drill

Buses in Grip of Tax Tangle

(Continued from page 573)

To arrive at an average special tax per bus for the industry, it was necessary to apply these group averages to the total number of buses in each group as follows:

12,000 City buses at $565	$6,780,000
4,840 Interstate buses at $625	3,025,000
29,728 Intercity-intrastate buses at $418	12,426,304
46,568 Total all buses	$22,231,304

When different but accepted methods based on wholly different data bring out the identical conclusion, its accuracy is reasonably assured. The figure for total taxes published in "Bus Facts for 1929" did not include general taxes. It was $22,000,000. It was arrived at in an altogether different manner and was determined before any of the present material was available.

The average special tax of $477 is revealed by dividing $22,231,304 by 46,568. We may, therefore, reduce this to $475 and add $85 for general taxes, which gives a total per bus tax of $560.

Amounts mean very little unless considered in relation to something. Since most of the critics of bus taxation dwell on the argument that the bus is not paying its way on the highway which is maintained at public expense, it is well to examine those aspects here.

According to the conclusions of Bulletin No. 85 of the engineering experiment station of the Iowa State College of Agriculture, the common carrier bus is not the controlling factor in the life or wear of surfaced or gravel highways. And with respect to wear in particular of surface and joints on paved highway there was no evidence, according to that bulletin, that it was any more important a factor than the private car.

Inasmuch as the information at hand contained the operating statistics of practically 20 per cent of the industry and was representative it was believed that if there were constant relationships between bus performance, such as annual mileage, gasoline consumption, etc., and seating capacity, these correlations would show up. A search was made and it was found that the curves (Figs. 2, 3 and 4) could be derived, according to simple mathematical formulas. The curve in Fig. 1 was derived from the manufacturer's records.

These curves are lines of true normal expectancies or standard averages. They represent points around which the performance in a given item for all buses of a given size will center. They, therefore, afford a fundamental basis for levying or measuring taxation. They reveal two important facts: (1) There is no similarity between city and intercity bus performance; (2) there is no similarity between performance of vehicles of different capacity even in the same kind of service.

The data from these standard curves were used to evolve curves showing the relative effect or value of the more prominent tax basis as a measure of wear upon the highway. The ton-mile is perhaps the safest measure we may now use of comparative highway wear between vehicles of a given type or in a given service. The ton-mile at one-third load is therefore used tentatively as the standard. One-third load was the average of the association's "Study of 1928 Operating Costs."

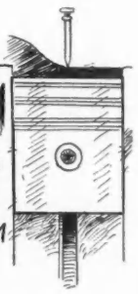
Automotive Oddities by Pete Keenan

ALEXANDER WINTON IS CREDITED WITH SELLING THE FIRST AUTOMOBILE MANUFACTURED ACCORDING TO SET SCHEDULES.

DURING THE DROUGHT SEASON IN EPERNAY, FRANCE, THE NATIVES USE WINE IN THEIR RADIATORS.

WHEN AUTOS FIRST APPEARED IN ENGLAND A MAN WALKED IN FRONT WITH A RED FLAG.

PISTONS MOVE FASTER DURING TOP HALF OF STROKE THAN DURING BOTTOM HALF.



IN 1907 GLENCOE, ILL., A SUBURB OF CHICAGO, INTRODUCED CROSS BUMPS ON IT'S VILLAGE STREETS TO STOP SPEEDING.

First with the News

Reliable, Accurate

News of the Industry

PAGE 597 VOLUME 62 *Philadelphia, Saturday, April 12, 1930* NUMBER 15

Committee Amends the Parker Bus Bill

Orders Favorable Report to Senate in Revised Form

WASHINGTON, April 10 — While considerable opposition has already developed to the Parker Motor Bus Bill, which the Senate Committee on Interstate Commerce yesterday ordered favorably reported, the view now prevails that the measure likely will be passed by the Senate at the present session. It passed the House on March 24.

Couzens Offers Amendment

Three amendments were made by the Senate committee which expects to report the bill the forepart of next week. An amendment offered by Senator Couzens, chairman of the committee, makes it mandatory for the interstate commerce commission to issue certificates, of public convenience and necessity for qualified applicants for operating bus lines where there is lack of bus competition. Under this amendment, competition would not be deemed actual unless it is competition in good faith between at least two common carriers by motor vehicle which are not associated with each other in any way. This amendment, it has been indicated, will create considerable controversy.

Another amendment was inserted which, according to Senator Couzens, is intended "to prevent the mergers of railroads under the guise of bus consolidations." The effective day of beginning bus operations was changed to 20 days from 10 days after findings of the examiners of the commission. Aside from some clarifying language, the Senate bill is otherwise similar to the House bill.

Raskob Sails for Europe

NEW YORK, April 9—John J. Raskob, formerly chairman of the finance committee and now a vice-president and member of the executive committee of General Motors Corp., sailed yesterday for Italy on the Roma of the Italian line.

Inland Promotes Sykes

CHICAGO, April 8—Wilford Sykes, general superintendent of plant of the Inland Steel Co., has been appointed assistant to the president, succeeding David P. Thompson, deceased.

Advertising Man Sees Revision of Policy

CHICAGO, April 7—Motorists themselves are building automobiles today, and the time has come for motor car manufacturers to put more novel ideas into their products than into their advertising, said Ernest Elmo Calkins, well-known New York advertising man, in a recent talk before the Chicago Advertising Council. Consumers are going to demand a reorganization of advertising, he said, because too much advertising is being devoted to products from force of habit.

Soviet Official Sails With Car Plant Plans

NEW YORK, April 10—Designs for the construction of an automobile factory at Nizhni Novgorod in the Soviet Union, to produce 120,000 Ford cars a year, are being taken to the Soviet Union by S. S. Dybetz, head of the Soviet Automobile Plant Construction Bureau, who left yesterday on the *Mauretania* after a stay of more than a half-year in this country.

Mr. Dybetz stated that his organization now has in Detroit more than 120 men engaged in designing the automobile plant and in studying production methods at the Ford plant. The designs for the buildings for the Nizhni Novgorod plant were prepared by the Austin Co. of Cleveland, Ohio, with whom the Soviet Automobile Construction Bureau also has concluded a contract for the construction of the plant.

The Nizhni Novgorod automobile factory, which is one of the three automobile plants now under way in the Soviet Union, will build cars of the Ford A and AA types, in accordance with an agreement made with the Ford Motor Co. last year. The plant is expected to be completed in 1932.

Ford Production Gains

DETROIT, April 8—World production of Ford cars and trucks in March was 169,045, the Ford Motor Co. announced today. This compares with 131,747 in February and 98,529 in January, the first month after the introduction of the improved Model A. April schedules call for daily production of about 9000 cars and trucks.

Air Operators' View Presented in Paper

N. A. T. Officials Cite Desirable Factors for Plane Engines

DETROIT, April 10 — "What does the airplane operator think about transport planes and engines?" That question was partly answered in a paper by E. P. Lott and Wesley P. Smith of National Air Transport at the Society of Automotive Engineers' aeronautical meeting, held in connection with the All-American Aircraft Show. The paper in addition to criticising present design also embodied numerous practical recommendations for improvement. Automobile type cowling, shock absorbing engine mounts as in automobiles, fuel systems in unit with the engine, and provision in the original design for the equipment necessary for transport operation.

Warner Presents Paper

A paper which also had a close bearing on this subject was that presented by E. P. Warner, president of the society. Mr. Warner by taking assumptions based on approximate present practice derives a figure by arithmetic for transport planes which shows that every pound saved in the engine results in a $11 saving annually to the operator, with $14 saved per year for every pound eliminated from the airplane structure.

Others papers presented at the aeronautical meeting of the society were one on the new Packard Diesel engine by Capt. L. M. Woolson, a paper by P. T. Wright, explaining the development and principles of the Curtiss Tanager; another by William J. Perfield Stout, engineering laboratories, on glider design, and a paper on supercharger design by Sanford A. Moss of the General Electric Co.

Prices Live Topic

Price reductions, further lines of airplanes, with the opening of the Detroit Show, provided further discussion as to the present downward price tendency. Some companies still feel that price reductions are decidedly inopportune. Up to Thursday the show had not been productive of many airplane sales in this respect, being no exception to similar other exhibitions.

Men of the Industry and What They Are Doing

Smith Leaves Peerless; Plans Are Undetermined

Don P. Smith, since July 1, 1929, vice-president of the Peerless Motor Car Corp., has announced his withdrawal from the company, both as vice-president and director. He said that his action was entirely voluntary and that he held an extremely friendly feeling both for the officials of the company and the organization itself.

Mr. Smith came to Cleveland nine months ago with James A. Bohannon, president of Peerless. Smith was formerly connected with the Guardian Detroit Company, as assistant to the president. His life work has been devoted to salesman, dealer and financial adviser in the automobile industry. Future plans, Mr. Smith said, were not definitely determined.

Williams Visits Factory

O. H. Williams, managing director of Hudson-Essex Motors, Ltd., London, England, visited the factory of the Hudson Motor Car Co., last week, arriving Monday and leaving Friday. The English company recently completed a branch assembly plant at Brussels which will have a capacity of 20,000 cars yearly. Other plants to serve Europe are maintained in London, Berlin and Danzig.

Overlock Leaves Studebaker

J. C. Overlock, assistant to A. R. Erskine, president of the Studebaker Corp., has resigned to become vice-president and treasurer of the Grigsby-Grunow Co. of Chicago, manufacturers of the Majestic radio.

Resigned

Don P. Smith

A vice-president and director of the Peerless Motor Car Co., since July 1 of last year, who has resigned both positions. Mr. Smith joined the Peerless organization in company with James V. Bohannon, president, who remains head of the company

Redman is in California

James E. Redman, general sales manager of the automotive division of the American Bosch Magneto Corp., is now in California on his annual tour of inspection. Mr. Redman will spend the greater part of his time in making final arrangements for the West Coast distribution of the new Bosch automobile radio.

O'Shaughnessy Promoted By United States Rubber

Joseph O'Shaughnessy has been appointed general manager of the tire department of the United States Rubber Co., with headquarters at Detroit, according to announcement made April 7 by F. B. Davis, Jr., president and chairman of the board of the company. Mr. O'Shaughnessy has been assistant to L. D. Tompkins who, in addition to his duties as vice-president and member of the executive committee of the company, has been general manager of the tire department.

Budd is Convalescent

Edward G. Budd, president of the Edward G. Budd Mfg. Co. and the Budd Wheel Co., who has been touring in Europe for the past three or four weeks, is now in a hospital recovering from a slight operation. Word received here indicates that he is in no danger and will be leaving the hospital in a few days.

Wetstein is Promoted

Edward L. Wetstein, sales manager of the Michigan Steel Corp., has been elected a vice-president according to an announcement by the board of directors. Mr. Wetstein has been with Michigan Steel since its formation in the fall of 1922. Previously he was with American Sheet and Tin Plate.

Hersam in New Company

Hersam & Sherwood, Inc., consulting, designing and industrial engineers, has been organized as successor to the Progressive Engineering & Tool Co., Conrad O. Hersam announces.

Experiments With Coach

CHICAGO, April 7—The Chicago Motor Coach Company has begun experiments with a six-wheel type of vehicle equipped with twin eight-cylinder motors. According to Garret T. Seely, vice-president and general manager of the company, the new coach possesses superior riding qualities because of the extra-sized balloon tires with which the six wheels are equipped. All interior gas odors are said to be eliminated through a new ventilating device, which carries a vertical exhaust pipe from two engines to the rear of the coach and releases the vapor at the top of the body.

Illinois Sales Drop

CHICAGO, April 7—Illinois' automobile sales for the first quarter of 1930 are 13,477 cars less than for the first quarter of 1929, according to a report from the research department of the Illinois Chamber of Commerce, giving March new car sales in the state as 16,084. The total for the first three months of 1930 is 42,217 cars as compared with 53,694 for the same period in 1929.

Allis-Chalmers Orders Gain

CHICAGO, April 7—Total orders of the Allis-Chalmers Mfg. Co. for the quarter ended March 31, 1930, amounted to $14,662,000, an increase of $1,402,000, or about 10.5 per cent, over the orders for the first quarter of 1929, which totaled $13,260,000. Bookings for the month of March totaled $6,128,000. On April 1, 1930, the company had unfilled orders of $15,554,000 on its books, against $12,872,000 on Jan. 1, 1930, an increase of $2,672,000, or nearly 22 per cent.

G. M. Truck Co. Conducts Course

DETROIT, April 7—The General Motors Truck Co., Pontiac, Mich., is conducting a course in truck maintenance for the 20 motor transport officers of the United States Army O. R. C., under the supervision of Capt. O. M. Brede, Special Reserve.

Diesel Engines Tested

DETROIT, April 3—The first test flight of a multi-motored air transport powered by oil burning aircraft engines was conducted successfully this afternoon (Wednesday) at the Ford Airport, Dearborn, Mich. The plane was a trimotored Ford transport and its three engines Packard Diesel Radial air-cooled. It was piloted during its flight by Leroy Manning, chief test pilot of the Ford Motor Co. He was accompanied by Captain L. M. Woolson.

Glass Company Restrained

WASHINGTON, April 10—The Federal Trade Commission has announced that it has ordered the L. J. Houze Convex Glass Co., Point Marion, Pa., to discontinue representing a glass gear shift ball for use on automobiles as "Marblex Onyx." The commission said that the company sold its gear shift balls in connection with an article for the jobbing trade called an "Extension Lever."

Moon Faces Proxy Fight as Eastern Group Enters

Special Stockholders' Meeting Has Been Called

ST. LOUIS, MO., April 9—The fight for control of the Moon Motor Co., pioneer in the automotive industry, here, has resulted in the calling by eastern interests of a special directors' meeting for April 12, to vote on the question of removing the present officers.

Despite opposition of the officers and old directors, the new interests held a special stockholders' meeting April 7, and voted to increase the number of directors from seven to fifteen, the easterners obtaining the additional eight and with it apparent control of the company. President Carl W. Burst, and other officers of the company could not be reached for statements. It is understood they protested against the meeting as unauthorized, and will refuse to recognize the new directors or the contemplated change of management.

The directors added to the board are: W. J. Muller and F. E. Welch, New York; and S. Mayner Wallace, A. M. Menzi, Samuel P. Liberman, V. L. Kadell, L. J. Portner, and A. Franey, St. Louis. The latter six are temporary directors and with the exception of Portner, are associated in the law offices of Wallace and Tom M. Pierce, local counsel for the easterners.

Welch and Muller are capitalists, connected with New Era Motors, Inc., which recently sold its assets to the Moon company, including rights to manufacture the Ruxton front-wheel drive automobile.

The Welch-Muller interests obtained stock in the Moon company when it recently increased its capitalization 100,000 shares to 350,000 to acquire the Ruxton assets and additional working capital. Attorney Wallace announced his clients, at yesterday's meeting, represented 243,000 shares and, in addition, held proxies from a large number of old Moon stockholders, aggregating many thousands of shares.

Toledo Employment Gains

TOLEDO, April 7—Employment in 51 Toledo plants mostly automotive is now 27,285, as compared with 46,853 at same time last year. Payrolls have been gaining by about 500 names a week in the last month. Willys-Overland is reported producing about 500 cars a day and planning increasing schedules. Electric Auto-Lite is running on a full normal schedule. Chevrolet Motors Ohio Co. has restricted output a little, due to large schedules first two months of the year.

Sells Used Cars Abroad

NEW YORK, April 8—Packard Motor Car Co. of New York is successfully shipping a number of used cars abroad and has found an active demand in this field. Some of these cars have been shipped to Australia where purchasers have willingly paid the cost of changing the steering apparatus from the left to the right side of the car. Other used Packards have been shipped to Venezuela, Rio de Janeiro, Buenos Aires and other South American points.

Garage Men to Meet

LOUISVILLE, April 7—The fifth annual convention of the International Garage Association opens Thursday, April 10, at the Brown Hotel. The meeting continues through Saturday. Garage owners and operators from all sections of the country will be here, F. M. Rassinier, president, said. S. J. Elder, Brown Garage, is chairman of the entertainment committee. Milliard C. Dorntge, Buffalo, president-secretary of the international group, makes his report Thursday. Austen Galley, New York City, talks on Ratios of Overhead Charges; W. J. Kommers, Spokane, Wash., Service Charges and Gross Profit. Election takes place Saturday.

Congratulations

G. M. Williams

Automotive Industries felicitates the president of the Marmon Motor Car Co., whose birthday occurred on April 6

Defiance Salesmen Meet

CHICAGO, April 7—District managers from Iowa, Minnesota, Wisconsin, Illinois and Indiana for Defiance Spark Plugs, Inc., of Toledo, Ohio, held a divisional sales meeting in Chicago recently. Addresses were made by Raymond P. Lipe, president, and L. L. Siegfried, vice-president and general sales manager of the company. Business was reported as "running 100 per cent ahead of 1929."

Tillotson Has Anniversary

TOLEDO, April 7—The Tillotson Manufacturing Co., makers of carburetors, observed the fifteenth anniversary of the beginning of the business on April 1. Harry C. Tillotson, president and founder of the company, is active in management of the Willys-Overland Co. here as a member of its executive committee, and is also president of the Toledo Chamber of Commerce this year.

Willys-Overland Sales Decreased 18 Per Cent

Annual Report Describes Position of Company

TOLEDO, April 7—Profits from operations amounting to $4,023,284 after full ordinary depreciation but before heavy charges for doubtful accounts, dismantling, rearrangement and other special charges non-recurring were reported by the Willys-Overland Co., for 1929, according to the report issued to stockholders by L. A. Miller, president.

The company had net sales of $159,810,503, which was brought in from sale of 257,407 cars, a decrease of 18 per cent from the previous year. Cost of sales including depreciation and inventory adjustments totaled $143,680,315. Other income amounting to $952,751 brought the total income to $17,082,939.

Selling, general, administrative expense plus bad debts, dismantling, plant rearrangement and miscellaneous losses amounted to $15,985,164. Interest expense was $582,937. This left $514,836 as the profit before special expense.

The company took a special amortization on tools, dies, jigs and fixtures of $2,649,058, provision for losses on miscellaneous notes and accounts receivable amounting to $2,058,827, and a charge-off of $786,807 for price reductions and allowances as a result of new dealer policy which brought a loss of $4,979,857 chargeable to surplus account.

During the year the company paid $1,058,344 in preferred dividends, $2,698,955 in cash dividends to common stock, and $714,230 in stock dividends to common holders. The total resulting charge to surplus was $9,451,386, bringing that fund to $30,179,785 at the close of the year.

Australian Tariff Increased

WASHINGTON, April 10—The Australian tariff, effective April 4, provides an increase of 50 per cent in the import duties on automobile bodies, assembled chassis, automobile parts, not being parts of an unassembled chassis; motorcycles and motorcycle frames whether partly or wholly finished, but not including rubber tires and tubes. It was stated that the higher duty on automobile bodies has little significance, since practically all of those used in Australia are of domestic manufacture. The tariff is quite drastic as a whole. In addition to providing 50 per cent increases in rates of duty, it also carries a provision which embargoes a long list of importations, and another which cuts imports to 50 per cent of those received during the 12 months ended March 31.

Steel Institute to Meet

NEW YORK, April 7—The American Iron and Steel Institute will hold its 37th general meeting at the Hotel Commodore here on Friday, May 9. Among the topics for discussion at this meeting will be The Contribution of Science to the Iron and Steel Industry, and Utilization of Waste Heat in the Steel Industry.

Grade Crossing Report Shows 385 Eliminated

Relocation of Highways and Underpass Construction Used

WASHINGTON, April 10—In 1929, a total of 385 railroad grade crossings were eliminated on the Federal-aid highway system, according to a report just issued by the Bureau of Public Roads of the U. S. Department of Agriculture. Forty-eight crossings were eliminated by the construction of grade-separating bridges carrying the highway over or under the railroad, and 337 by relocation of the highway to avoid the railroad. Since 1917, the records of the bureau show, a total of 4676 grade crossings have been weeded out of the system—995 by grade separations and 3681 by relocations.

Georgia heads the list with 82 eliminations in 1929. Alabama is second with 40; Texas reported 34 eliminations; Montana, 27; and Mississippi, 18. Kansas and Washington each reported 15; Arkansas, South Carolina and Wisconsin, each, 12; Florida, Nebraska, Oklahoma and Wyoming, each, 10; and Minnesota and Virginia, each, weeded out 9.

Texas heads the list of elimination by grade separations with 9; Kentucky is second with 6; Wisconsin reported 5; Montana, New York, Oklahoma and Oregon, each reported 4; Connecticut, Missouri, South Carolina, Utah, Virginia, West Virgnia and Wyoming, each reported 5.

Trucks Aid Fruit Growers

NEW YORK, April 9—Motor trucks are now moving 65 per cent of the fruit of southern Indiana, 23 per cent of Southern Illinois, 53 per cent in Virginia and 16 per cent in Delaware and Maryland, according to the findings of Brice Edwards, assistant marketing specialist of the Fruits and Vegetables Division of the Bureau of Agricultural Economics.

Mr. Edwards says that the movement by motor truck is working a revolution in the selling of fruit and vegetables. The trade formerly was supplied through wholesale dealers obtaining their supplies from St. Louis, Memphis, Chicago and Indianapolis. The trucking movement avoids these primary markets for the most part and goes direct to the consumer and wholesaler in smaller towns and cities.

Cord Dealers Distribute Book

AUBURN, IND., April 8—Cord front-drive dealers and distributors have distributed about 50,000 copies of the new Cord owner book to date. The 154-page book contains hundreds of letters from owners of Cord front-drive cars, telling of their experiences with the machine and what they think of its performance and appearance. Owners listed in the book have driven their cars approximately 10,000,000 miles.

Financial Notes

Allis Chalmers Mfg. Co. has declared regular quarterly dividend of 75 cents, payable May 15 to stockholders of record April 24.

Allied Motor Industries reports consolidated net income for 1929 of $211,599 after all charges. This is equivalent, after preferred dividends, to 47 cents a share on common stock.

Graham-Paige Motors Corp. reports net loss for the year 1929 of $343,484 after all charges. After adding losses from operations of subsidiary companies, consolidated net loss for the year was $1,463,587. This compares with net profit for the year 1928 of $1,055,678.

The Aviation Corp. reports consolidated net loss for the period from March 1, 1929, to Dec. 31, 1929, of $696,727, or 23 cents a share, before proportional losses of controlled companies and provision for special losses and expenses of $747,094. Including these extraordinary charges, loss for the period was $1,443,822, or 47 cents a share.

Committee Agrees on Tariff

WASHINGTON, April 10—The Senate automotive paragraph of the Hawley-Smoot tariff bill was agreed to in its entirety by the House and Senate conferees on Tuesday of the present week. The Senate rate is 10 per cent on automobiles, automobile chassis, and automobile bodies and motorcycles and will become the new rate when the bill is finally passed after being reported back to the House and Senate by the conference. The present rate is 25 per cent and it was continued in the House bill. The Senate rate for trucks and truck and motor bus chassis, and motor buses is 25 per cent, as is the rate on parts, except tires, for trucks, buses and passenger cars. The prevailing rate on automobiles, chassis, bodies, motorcycles and parts, except tires, is 25 per cent.

Another important feature of the Senate automotive paragraph was the elimination of the countervailing clause which the House bill continued. The Senate paragraph reducing the duty on passenger cars and striking out the countervailing provision reflected the unusual position taken by the automotive manufacturers in asking the Senate Finance Committee to take both actions.

Pierce Has Service Clubs

BUFFALO, April 9—To further the training and spirit of its service organizations throughout the country, the Pierce-Arrow Motor Car Co. has announced the development of Pierce-Arrow Service Clubs, whose members meet regularly to study improved maintenance methods. "These Pierce-Arrow workmen make a thorough study of every plan which improves service and lowers upkeep costs to owners," said F. J. Wells, general service manager, "and regular meetings are held periodically, attended by every Pierce-Arrow service man in the region."

Rail Shipment Expense Reaches $206,236,791

This Figure Excludes Unfinished Materials, Marvin Says

DETROIT, April 10—Rail revenues from automobile shipments, exclusive of unfinished materials, according to Interstate Commerce Commission reports, rose sharply during 1929, as reported by J. S. Marvin, chairman of a meeting here today of Traffic Managers, members of the National Automobile Chamber of Commerce.

The total was $206,236,791 and shipments passed the million mark for the first time, with 1,017,336 carloads. Figures include only automobiles, trucks, parts and tires which in 1928 amounted to 936,107 carloads and $193,798,936 revenue.

"Figures on gasoline shipments, cement, steel and other unfinished materials used in the industry are not yet available," said Mr. Marvin, "but all automotive freight will be found to exceed considerably the 3,500,750 carloads which in 1928 paid the rail carriers $542,170,000."

Export Men Move

NEW YORK, April 9—M. C. Hale, assistant to the general manager of General Motors Export Co., and Allan Wescott, assistant general sales manager of General Motors Export Co., in charge of parts, returned from a short visit to European assembly plants of the company aboard the S.S. *Majestic* last week.

Other General Motors overseas personnel returning recently to this country include R. A. Wilson, treasurer of General Motors Japan, who is home for a vacation; E. R. Teitz, chief inspector of General Motors Australia, who comes to New York for a new assignment; H. F. Kropshuser, sales representative, stationed in Mexico City; E. A. Keeble, parts manager of General Motors Java, who came to New York for a visit to the home office, and C. W. Nugent, transportation engineer of General Motors Polsce, who also arrived for a new assignment.

F. C. Lynch, assistant to the European regional director, sailed last week on the *Majestic* to return to his post after visiting the home office; F. L. Hopkinson sails this week on a special assignment taking in G. M. assembly plants in Montevideo, Uruguay; Sao Paulo, Brazil, and Buenos Aires, Argentina.

Cord Exports Increase

CHICAGO, April 8—Export shipments of Cord front-drive cars in March, 1930, were 11 per cent greater than any previous month since the car was announced, according to R. S. Wiley, export manager, who revealed that March shipments were 66 per cent greater than for February of 1930 and 10 per cent greater than for March, 1929.

General Motors' Share of Registrations Gains

Steady Progress in Six Years is Shown

NEW YORK, April 12—Out of a total passenger car registration at the close of 1929 of 22,599,701, General Motors Corp. manufactured 6,356,901, according to Alfred P. Sloan, Jr., president of the company. This number is almost the equal of the total number of passenger cars registered ten years ago.

Mr. Sloan regards this as a gratifying tendency not only because of the number of cars sold but because of the tendency on the part of motorists to replace cars with those with which they are familiar. He calls attention further to the necessity of proper service on the part of General Motors units in order to maintain the goodwill which is now felt by the car using public.

Passenger Cars in Use

Year	Total Passenger Cars	General Motors Passenger Cars	Per cent General Motors
1924	15,350,038	2,697,272	17.57
1925	16,887,250	3,041,615	18.01
1926	18,915,260	3,741,984	19.78
1927	19,410,175	4,483,521	23.09
1928	20,673,852	5,412,265	26.18
1929	22,599,701	6.356,901	28.13

February Sales Totalled

PHILADELPHIA, April 10—Final February new passenger car registration figures show a total of 211,645, an 18 per cent gain over January but a 9.7 per cent loss from February last year. For the first two months of the year, the registration total is 391,739 which is 13.8 per cent behind the same period in 1929.

Chevrolet registrations in the first two months have registered a gain of 15 per cent over last year while Ford registrations in the same months are 4 per cent larger. Ford in the first two months has increased his percentage of total business to 40.7 per cent as compared with 33.7 per cent in the same period last year. Chevrolet also shows an increase in percentage of total, the comparative figures being 18.4 per cent last year against 24.6 per cent this year.

Dickenson to Attend Conference

WASHINGTON, April 10—Dr. H. C. Dickenson, chief or the Heat and Power Division, Bureau of Standards, will sail from New York on May 15 on his way to attend the World Power Congress in Berlin, June 16-25. He may also attend the International Technical Congress in Stockholm, June 27-July 9. It is the plan of Dr. Dickenson to stay in England, mostly in London, about 10 days, after which he will go to Leyden, Holland, to remain two or three days before proceeding to Berlin.

A.A.A. Reelects Governors

NEW YORK, April 9—The Automobile Club of America reelected the following governors for the term expiring in 1933 at its general meeting yesterday: Vincent Astor, Phillip G. Gossler, Arthur Iselin, Dudley Olcott, E. H. Outerbridge and Frederick D. Underwood.

Ford Earnings Gain

DETROIT, April 9—The indicated profits of the Ford Motor Co. for year ended Dec. 31, 1929, were $81,797,861, according to the balance sheet filed with Massachusetts commissioner of corporations, as compared with $72,-221,498 in 1929. This is equal to $473.79 a share on 172,645 shares outstanding.

Samuel B. Lambert

DETROIT, April 8—Samuel B. Lambert, aircraft manufacturer of Moline, Ill., was killed yesterday when the airplane he was piloting from Moline to Detroit fell about a mile south of the airport at South Bend, Ind. Until about a year ago he was president of Lambert-Graves automobile agency at St. Louis.

Gasoline Prices Increased

NEW YORK, April 9—New York and New England are affected by an increase of one cent in the price of gasoline announced today by the Standard Oil Co. of New York, the Shell Eastern Petroleum Corp., and the Richfield Oil Corp. of California. Leader in the move was the Standard Oil Co. Sir Henri Deterding, chairman of Shell, who arrived in the United States this week, heralded the move as a recognition on the part of American producers that they could not make money under the existing price scale.

Foote Brothers Sales Gain

CHICAGO, April 8—Sales of the Foote Brothers Gear & Machine Co. in the first quarter of 1930 showed a 30 per cent increase over the same period a year ago, W. C. Davis, president, announced. Sales in March, 1930, exceeded those of the same month in 1929 by nearly 35 per cent, he added. All plants of the company are in active production at the present time.

Ford to Assemble Trucks in Philadelphia Plant

Reconditioning of Former Operating Unit is Begun

PHILADELPHIA, April 10—Reconditioning of the former Ford assembly plant here has been begun with a force of 200 workers, and it is understood that assembly of truck units will commence in the near future. Assembling at the local plant was discontinued about three years ago with the beginning of operations at the Chester plant.

The Philadelphia plant is a ten-story building, and has been used recently for a special display of Lincoln and Ford cars. When the assembling of trucks is begun it is planned to have a permanent truck exhibit, and to centralize the distribution of truck parts for the area serviced by the Philadelphia and Chester plants. From 750 to 1000 men will be employed in assembly and distribution operations. About $50,000 will be spent in reconditioning the plant.

Don Misses at Sixth Attempt

DAYTONA BEACH, April 10—With the avowed purpose of making an actual try for the world's mile straightaway speed record, Kaye Don, driver of the "Silver Bullet" special Sunbeam racing car, made his sixth attempt at the mark here today. The trial resulted in a failure so far as breaking the record was concerned. The maximum speed attained was 182.471 m.p.h.

A rough spot in the north run on the beach, and the tendency for the wind screen to mist-up were ascribed as the causes of today's failure to break the record established last year by Major Sir Henry O. D. Segrave in the Napier-Lion "Golden Arrow." Following the failure of the sixth attempt, late in the afternoon, further trials were suspended for the day and it was announced that no further run would be attempted until the beach conditions improved.

Rubber Invoiced to U. S.

WASHINGTON, April 8—American consular officers at Singapore, Penang, Colombo, Batavia, Surabaya, Medan, London and Liverpool, whose vise invoices on all rubber shipped to the United States from Malaya, Ceylon, Netherland East Indies, and the United Kingdom, report by cable the following amounts of rubber invoiced during the week ended April 5, as compared to amounts invoiced in 10 preceding weeks:

1930 Week Ended	British Malaya	Ceylon	Netherland East Indies	London and Liverpool	TOTAL
Jan. 25	9,212	1,103	2,051	14	12,380
Feb. 1	5,078	1,213	1,679	98	8,068
Feb. 8	9,902	1,788	2,572	31	14,293
Feb. 15	7,223	1,312	1,315	59	9,909
Feb. 22	7,010	1,223	2,389	51	10,673
March 1	8,146	2,315	2,898	57	13,416
March 8	6,637	925	1,990	45	9,597
March 15	6,256	658	1,786	10	8,710
March 22	7,075	753	1,997	19	9,844
March 29	5,867	1,335	1,462	Nil	8,664
April 5	7,435	779	2,109	Nil	10,323

All figures in long tons.

Steel Demand Gaining as Mills Seek Volume

Automotive Specifications Retain Steady Prices

NEW YORK, April 10—Demand for steel products from automotive consumers is gaining momentum. Producers are striving with might and main to obtain a sufficient volume of specifications to permit their operating at a higher rate than was the case last month. Pressure of unemployed capacity is having its effect on prices. Full-finished automobile sheets are holding their own at 3.80 cents, Pittsburgh, $6 a ton below the price that was current a year ago and the lowest price since the 20-gage basis superseded the 22-gage.

Black sheets are still selling at as low as 2.55 cents, Pittsburgh, the lowest level in many years. More and more mills, however, are striving to restore the 2.65 cents level. Hot-rolled strip-steel has given way another $1 per ton, and is now quotable at 1.80 @ 1.90 cents on 6-in. and under and at 1.70 @ 1.80 cents, Pittsburgh, on over 6-in. to 24-in. For cold-rolled strip steel 2.55 cents, Pittsburgh, appears to be the inside price. Soft steel bars are quoted at 1.80 @ 1.85 cents, Pittsburgh, $1 a ton under the 1929 average.

Cold-finished steel bars at 2.10 cents, Pittsburgh or Cleveland, are selling below the average price for the last 10 years. There is no gainsaying the fact that prevailing steel prices are attractive from the buyer's viewpoint, and much as producers would like to see them on somewhat higher levels, their principal concern at this time is a sufficient volume of orders to permit of more economical rolling schedules. To some extent lower costs of production have been responsible for easier conditions in some finished steel products, but paucity of orders enabling producers to utilize only part of their equipment tends to offset such economies.

Pig Iron—Middle West automotive foundries are melting and taking on more iron. Here and there, buyers are able to secure slight concessions, but on the whole the market presents a fairly steady appearance. In the Detroit market, No. 2 foundry and malleable continue to be quoted at $19.50, furnace.

Aluminum—The primary market situation remains unchanged. Secondary metal specialists report somewhat better inquiry from parts and accessory makers. The supply of scrap is on the increase. Remelters are holding buying prices for scrap down as much as possible, so as to make up for increased overhead due to lessened sales volume.

Copper—Buying by domestic consumers is along routine lines. Wall Street reports of the impending formation of a pool to care for surplus accumulations of copper on producers' hands are given little attention in the copper market. Electrolytic continues to be quoted at 18c delivered Connecticut, and 18¼ c delivered Middle West.

Tin—The market has again turned attractive for buyers, Straits tin being quoted at the beginning of the week at 36⅛c.

Lead—The leading interest announced a $2 per ton cut in its contract price on Monday, having announced a $3 reduction at the close of last week. This brings the price down to 5.50c, New York. A year ago today, the price was 7.15c.

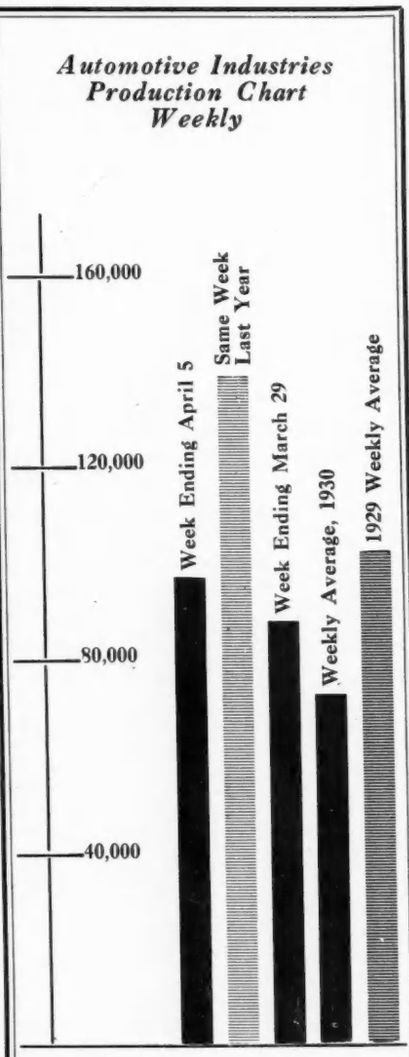
Zinc—Steady and unchanged.

Adds Ford Commitments

CLEVELAND, April 8—Ford orders received in the last month by Thompson Products, Inc., have doubled, necessitating the putting on of three eight-hour shifts at the Detroit plant of the organization, according to C. E. Thompson, president.

Appeals to Stockholders

NEW YORK, April 8—United Aircraft Corp. has sent a letter to stockholders of National Air Transport, Inc., outlining terms of a proposed merger on the basis of exchange of 3½ shares of N.A.T. stock for one share of United stock, and requesting stockholders to deposit their stock for this exchange at the City Bank Farmers Trust Co., New York. This offer was made previously to the board of directors of N.A.T. but was rejected by that body, and the letter is in the form of a direct appeal to the stockholders.



The composite chart appearing above will delineate each week production of passenger cars in the United States and Canada, for the week preceding publication of the issue in which it appears, together with production for the preceding week, and other factors. Data used in compiling it are obtained in confidence from a number of sources. Other factors may be added, dependent upon the cooperation of additional sources of information.

Reo Forms Voting Trust; Merger Rumor is Denied

Scott, Bates and Wilson to Have Voting Power

NEW YORK, April 8—Reo Motor Car Co. has set up a voting trust with Richard H. Scott, president; Donald E. Bates, secretary and treasurer, and William Robert Wilson, general manager, as the three voting trustees. This trust is set up to insure the continuance of a sound management policy and will continue until Dec. 31, 1932.

According to the announcement made by Mr. Wilson, this trust may be characterized as a three-year proxy, the stockholder retaining all his rights except that for three years he grants the voting power only to these three trustees.

Dividends on the trust certificates will be paid at the same rate as upon the stock and full provision is made for the return of the stock at the end of the trust. Directors of the company, together with many of their friends, have deposited their stock under the terms of this agreement.

There has been persistent rumor in connection with the formation of this voting trust that Reo is contemplating a merger with other companies. This rumor has been emphatically denied by Mr. Wilson, who says:

"Reo could gain nothing from such a merger. The company is and will continue to be independent in fact as well as in name. Our production ranges from the higher price models down to the popular priced units. It can take care of 93 per cent of commercial car requirements and has built up a varied line of buses."

Credit Companies Merge

NEW YORK, April 8—Commercial Credit Co. has acquired control of Credit Alliance Corp., a company specializing in the financing of sales and time and labor-saving and income-producing machinery used for industrial purposes. The acquisition was made on the basis of an exchange of stock, 80 per cent of the common stock of Credit Alliance being pledged for this purpose. The exact basis for the exchange has not yet been determined but when it has been outlined holders of the remaining 20 per cent of the Credit Alliance common stock will be afforded an opportunity to make an exchange on the same basis.

Joseph D. Harper

CHICAGO, April 7—Joseph Dursee Harper, 61 years old, manager of the Diesel engine division of Fairbanks, Mores & Co., with which he had been connected for more than 30 years, died Sunday, April 6, after a brief illness of pneumonia. He was a native of Indiana and a graduate of Rose Polytechnic Institute. He is survived by his widow and one daughter, Margaret. He made his home at 821 Michigan Ave., Evanston, Ill.

Argentine Imports Gain; Light Cars are Favored

Seventy-Six Per Cent Are in Class Below $700

WASHINGTON, April 7—The total number of American passenger cars imported into Argentina during 1929 was 65,442, as compared with 52,543 the previous year, or an increase of 21 per cent, according to a report received by the Automotive Division of the Department of Commerce, from American Trade Commissioner Thomas C. Ballagh at Buenos Aires.

The outstanding feature of the market was the increased popularity of the low-price passenger car, 76 per cent of imports of this type falling below the list price of $700, as compared with 64 per cent in 1928. On the other hand, the number of medium-price cars, listing between $700 and $2,000, fell from 35 per cent of total passenger car imports in 1928 to 23 per cent last year. High-price cars, priced over $2,000, again accounted for about 1½ per cent of the total, increasing about eight per cent over the previous year's figures.

The total number of American trucks imported in 1929 increased from 18,115 to 19,555, eight per cent, but low-price units decreased in popularity. The low-price truck still controls over 70 per cent of the Argentine demand, but the figures indicate a slowly growing preference for heavier models.

American passenger cars practically monopolize the market, imports of European cars falling from 1933 to 1453 in 1929. European trucks, on the other hand, increased 17 per cent, but totaled only 989 units.

Develops Supercharger

MARYSVILLE, MICH., April 7—A supercharger for aircraft, marine and automobile engines has been developed by Ralph De Palma in connection with the engineering department of American Cirrus Engines, Inc. The device has passed tests at the Naval Aircraft Factory in Philadelphia and has received an Approved Type Certificate from the Department of Commerce. The supercharger, it is stated, gives an increase in power of from 20 to 30 per cent and operates noiselessly. Special installations are now being worked out for four marine engines and several stationary engines, while installations for several quantity-production automobiles have been completed. The supercharger is said to be almost cylindrical in shape and to measure little more than 10 in. in both directions. It weighs about 45 lb. and is driven from the crankshaft through a flexible coupling. It has only two moving parts.

Thompson Gets Buick Order

CLEVELAND, April 7—Thompson Products, Inc., has signed a contract with Buick Motor Co. to manufacture all valves for Buick and Marquette cars during 1930. The initial order was received today for 411,000 valves. Shipments of these parts will begin at once from the Cleveland plant.

Studebaker Dealer Using Cantor Copy

CHICAGO, April 5—The Studebaker Sales Co. is distributing 20,000 copies of "Service Stripes," a booklet by Eddie Cantor, the comedian, as an interesting and effective sales stunt. In addition, the Studebaker Corporation of America has recommended the booklet to all its dealers, some of whom are running ads in local papers on the book pages, calling attention to the fact that the booklet will be given free to anyone who calls for it.

A. H. Bullard

BRIDGEPORT, CONN., April 8—Augustus Hall Bullard, secretary and treasurer of the Bullard Co., machine tool builders, died here April 5. He had originally entered the machine tool business in 1886, in association with his uncle E. P. Bullard, then proprietor of the Bridgeport Machine Tool Works, later incorporated as the Bullard Machine Tool Co. in 1894. It was at this time that Mr. A. H. Bullard was elected a director and secretary and treasurer of the company, a position which he has held continuously.

Mr. Bullard was active in civic, Masonic, and industrial affairs of Bridgeport and the state of Connecticut. He had served as president of the Connecticut Manufacturers' Association, of which he was one of the founders. He is survived by a brother, Walter Harvey Bullard, and by his wife.

Crude Rubber Quiet

NEW YORK, April 7—Cable dispatches from Borneo and Java indicate that the suspension of rubber tapping during the month of May will receive almost unanimous support, according to the weekly market letter of F. R. Henderson Corp. Trading has been comparatively quiet according to this letter, but a slight upward tendency is anticipated in view of the projected increase in tire manufacturers' schedules of from 10 to 20 per cent during the month. Stocks of crude rubber in London and Liverpool have increased to 89,233 tons and 21,193 tons, respectively. Further increases are anticipated this week. Arrivals of crude rubber at all ports of the United States during the first four days of April are estimated at 3800 tons.

Diamond T Sells to China

CHICAGO, April 7—Recently an order for three Diamond T trucks was received, following the recommendation of Gen. Y. C. Lee of Manchuria, China. Now Diamond T is to provide 20 trucks per month over a considerable period of time. While the purchase is primarily for military purposes, the trucks will also see regular service in peace time.

World Production Sets New All-Time Record

Preliminary Figures Announced by Automotive Division

WASHINGTON, April 7—World production of automobiles during 1929 set an all-time record, according to a statement issued today by A. W. Childs, chief of the automotive division, department of commerce. Mr. Childs estimates from preliminary figures that the producing countries of the world turned out in excess of 6,300,000 motor cars, which represents a gain of more than a million over 1928.

In 1929, approximately 685,000 were produced outside of the United States and Canada, while in 1928 the corresponding figure was 602,000. These figures cover only the production of automobile firms that are duly accredited to the various countries, and do not include assemblies of vehicles of one nationality in another country.

Substantial gains were recorded in England, France, Czechoslovakia, and several other producing countries, as well as, of course, in the United States and Canada. In a few countries, production did not equal the 1928 output. Detailed figures on all of the producing countries will be available in a few weeks, at which time Mr. Childs expects to furnish data on each of the more important producers.

Has New Inspection Device

PITTSBURGH, April 8—A portable stroboscopic device for the study of high-speed motions has been invented and developed by D. D. Knowles, L. R. Peters and W. E. Bahles of the Research Laboratory of the Westinghouse Electric & Manufacturing Co. It was demonstrated recently at Bettis Field, Pittsburgh, and is said to have made it possible to read markings on a propeller revolving at 1000 r.p.m. By means of this apparatus, caller the Stroboglow, propeller quiver and cracks, and valve action can be made visible to the naked eye, and it is thought probable that the instrument may be made part of the equipment used for inspecting a plane before it takes off for a flight.

The chief advantage claimed for the Stroboglow over similar earlier instruments is its ability to be used on the job, where the earlier instruments called for reproduction of operating conditions in the laboratory. The only requirement for its operation is sufficient darkness to render the flickering lights visible on the moving object.

Stinson Sells Diesel Plane

DETROIT, MICH., April 7—Sale of the first airplane in the United States powered by a Packard Diesel engine has been announced by the Stinson Aircraft Corp., which also stated that the Packard Diesel motored four-place Stinson Cabin monoplane is now listed as one of the regular models in the complete Stinson line of planes.

Additional Federal Aid for Roads Apportioned

Secretary Hyde Announces Distribution of Funds

WASHINGTON, April 7—Secretary of Agriculture Arthur M. Hyde today apportioned among the 48 states and Hawaii the sum of $48,750,000 of the additional $50,000,000 authorized by Congress as Federal aid for highway construction in the fiscal year beginning July 1, 1930. This supplementary appropriation for Federal-aid highways was authorized by the bill signed by President Hoover on April 4. The additional $50,000,000 brings the total appropriation for 1931 to $125,000,000.

All apportionments of Federal funds for highways in the Federal-aid system are based on the area, population and post road mileages of the states, and the share of each state is available for expenditure on roads included in the Federal-aid system under the joint supervision of the State Highway Departments and the Bureau of Public Roads of the U. S. Department of Agriculture. Apportionment of the 1932 authorization will be made on or before Jan. 1, 1931, and of the 1933 authorization on or before Jan. 1, 1932.

A tabulation of the apportionment to the states as certified by the secretary of agriculture, of both the original $75,000,000 authorization and the additional $50,000,000 for the fiscal year 1931 follows:

Apportionment of Federal Aid

Fiscal Year 1931	Apportionment of Original Authorization of $75,000,000.	Apportionment of Additional $50,000,000 Authorization.
Alabama	1,557,372	1,038,248
Arizona	1,062,190	708,127
Arkansas	1,293,086	862,057
California	2,501,170	1,667,447
Colorado	1,390,524	927,016
Connecticut	477,893	318,596
Delaware	365,625	243,750
Florida	921,558	614,372
Georgia	1,985,632	1,323,755
Idaho	932,594	621,729
Illinois	3,100,781	2,067,187
Indiana	1,909,505	1,273,003
Iowa	2,005,944	1,337,296
Kansas	2,048,585	1,365,723
Kentucky	1,414,610	943,073
Louisiana	1,040,195	693,463
Maine	675,106	450,071
Maryland	631,911	421,274
Massachusetts	1,090,022	726,682
Michigan	2,200,177	1,466,785
Minnesota	2,102,986	1,401,991
Mississippi	1,323,897	882,598
Missouri	2,382,383	1,588,255
Montana	1,552,865	1,035,243
Nebraska	1,586,526	1,057,684
Nevada	960,845	640,563
New Hampshire	365,625	243,750
New Jersey	936,234	624,156
New Mexico	1,190,296	793,531
New York	3,605,965	2,403,976
North Carolina	1,722,673	1,148,449
North Dakota	1,203,060	802,040
Ohio	2,753,528	1,835,685
Oklahoma	1,751,015	1,167,343
Oregon	1,197,667	798,445
Pennsylvania	3,314,707	2,209,805
Rhode Island	365,625	243,750
South Carolina	1,065,105	710,070
South Dakota	1,232,962	821,975
Tennessee	1,608,802	1,072,535
Texas	4,545,830	3,030,554
Utah	850,752	567,168
Vermont	365,625	243,750
Virginia	1,429,253	952,835
Washington	1,156,219	770,812
West Virginia	792,826	528,550
Wisconsin	1,849,169	1,232,780
Wyoming	942,455	628,303
Hawaii	365,625	243,750

American Bosch Improves

CHICAGO, April 5—After showing losses for December, January and February as the result of the demoralization of the radio business, the American Bosch Magneto Corp. broke even in its operations for March, and from now on the outlook is for progressive improvement, according to officials of the company. It is estimated the deficit for the first quarter will be between $150,000 and $200,000.

To Demonstrate Planes

NEW YORK, April 10—An American demonstration tour for the aircraft industry through European countries was started today by the sailing on the liner Vulcania of Lieutenant James H. Doolittle, Captain James H. Cannon and Lieutenant James E. Parker. These American pilots will travel through Greece, Turkey, the Balkans, the Baltic States, Poland, Switzerland and Scandinavia demonstrating four planes never before flown in Europe. The expedition is sponsored by the Curtiss-Wright Corp. and the planes to be used in this demonstration tour are the Curtiss Hawk, Curtiss Falcon, Curtiss Fledgling and Curtiss Robin.

Auburn Shipments Gain

AUBURN, IND., April 7—March shipments of the Auburn Automobile Co. totaled 2502 cars, a new high record for any similar month in the history of the company, as compared with 1869 cars in February and 2308 cars in March of last year. The total shipments for the first three months of 1930 were 6003 cars as compared with 5848 cars in the corresponding period of 1928. E. L. Cord, president of the company, pointed out that March shipments were not only the largest for any March in the company's history, but that the total for that month has been exceeded in only three months heretofore.

Oakland Plans Demonstration

DETROIT, April 12—The Oakland Motor Car Co., Pontiac, Mich., has announced that during the latter half of this month special demonstration Pontiac cars, identified by large red rockets painted on their sides, will be provided by Oakland-Pontiac dealers for the purpose of offering the public free demonstrations.

Purchasing Agents to Meet

NEW YORK, April 7 — National Association of Purchasing Agents, Inc., will hold its 15th annual convention at the Stevens Hotel, Chicago, June 16 to 19. The association will also conduct an Inform-a-Show in conjunction with the convention.

Stewart Reports Increase

BUFFALO, N. Y., April 7—Stewart Motor Corp. has reported shipments for March of 509 Stewart trucks, compared with 390 for the corresponding month of last year—an increase of 30 per cent.

State Fuel Taxes Reach Nearly Half a Billion

Average Amount Collected Increase 3.22 Cents, Report Shows

WASHINGTON, April 12—The 48 states and the District of Columbia collected $431,636,454 in taxes on the sale of 13,400,180,062 gal. of motor fuel in 1929, reports received by the Bureau of Public Roads of the U. S. Department of Agriculture show. This includes a 12-month collection in 46 states and the District of Columbia, a five-month collection in Illinois, and the collections of eight months in New York. Illinois and New York were the last states to adopt this method for part payment of the highway bill. The pioneer states—Oregon, Colorado, North Dakota and New Mexico—led the way in 1919. Now all the others have followed, but the tax did not become effective in New York until May 1 and in Illinois until Aug. 1.

The average fee per gallon was 3.22 cents as against 3 cents in 1928. In the course of the year 20 states increased the rate of taxation either one or two cents. The highest tax per gallon was six cents; the lowest two cents. At the close of the year 3 states had a 6-cent tax; 8 a 5-cent tax; 19 a 4-cent tax; 1, Utah, a 3½-cent tax; 10 a 3-cent tax, and 7 states and the District of Columbia a 2-cent tax.

In 1929 the rate per gallon was increased one cent in Colorado, Florida, Indiana, Kansas, Minnesota, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, Vermont, Washington, and Wyoming; two-cent increases became effective in Georgia, Louisiana, Montana, Nebraska, Tennessee and Texas.

Fokker Prices Reduced

NEW YORK, April 7—Fokker Aircraft Corp. of America announced price reductions of its planes at the opening of the Detroit show of from $4,000 to $13,000, making these planes available for operators at costs of from $1,500 to $3,600 per passenger seat, according to Captain E. V. Rickenbacker, vice-president in charge of sales. The new prices, together with the reductions from the old prices, are as follows:

	Places	Old Price	New Price
Standard Universal	7	$15,000	$11,000
Super-Universal	7	21,800	17,500
F-14-A Mail Plane	9	26,500	22,500
F-11-A Flying Boat	8	40,000	32,500
F-11-A Amphibion	8	42,000	33,775
F-10-A Trimotor	14	67,500	54,500

The new prices are effective immediately.

Oakland Used Car Sales Gain

DETROIT, April 12—The Oakland Motor Car Co., Pontiac, Mich., has announced that sales of used cars by its dealers during the period of March 10-31, this year, were 414 per cent greater than during the period from March 1-10. Last year the increase during these periods was 209 per cent. The Oakland retail organization has just completed a one-month used car selling campaign.

Harvester Report Shows 1929 as Its Record Year

Greatest Accumulation of Earnings is Recorded

CHICAGO, April 7—The annual report of the International Harvester Co. and affiliated institutions for the year 1929, which was issued Friday of last week, discloses a greater accumulation of earnings than in any previous calendar year. The company transacted the largest volume of business in its history in 1929, and both gross and net earnings set new high records. In the domestic field the gain in volume of business was derived principally from the large sale of tractors, power farming equipment and motor trucks, the report states. The largest percentage of gain was made in the foreign trade, due to an increased demand for the company's products, including motor trucks. The company's business in Canada fell off somewhat owing to the crop failures in the grain-growing provinces.

Gross revenues for the year 1929 aggregated $59,614,589, as compared with $49,333,613 in 1928, and $36,863,501 in 1927. The consolidated net profit was $36,779,998, equal after preferred dividends to $7.11 a share on 4,409,185 shares of no par value common stock outstanding. This compares with net profit of $29,685,350 in 1928 or $5.56 a share on the present capitalization.

Capital expenditures for 1929 exceeded those of any previous year, covering extensive additions to the Farmall tractor works at Rock Island, Ill., the Fort Wayne, Ind., motor truck plant, the steel mills at South Chicago and at many of the other works of the company, new motor truck sales and service stations, and additional warehouse facilities. The property account, less depreciation, expanded from $103,944,446 to $115,343,363 in the year.

Count de Liedekerke

PHILADELPHIA, April 7—A prominent member of the Belgian automobile industry, Count Jacques de Liedekerke, died recently at Senonches, Belgium. He was for several years president of the Belgian Automobile Manufacturers Asso., and president of the Governing Committee of the Royal Belgian Automobile Club. Last year he celebrated his twenty-fifth anniversary as president of the organizing committee of the Brussels automobile show.

Steel Output Aids Chicago

CHICAGO, April 7—Steel is giving a rapid impetus to Chicago's industrial activity that probably will see the city's $5,000,000,000 annual collective factory production materially increased before the end of 1930, according to the Chicago Association of Commerce. At present, the association's industrial surveys show Chicago is turning out more steel than all England, more than the Ruhr in Germany, and is competing on even terms with Pittsburgh.

Duesenberg Denies Rumor

INDIANAPOLIS, April 7—Rumors that Duesenberg, Inc., of Indianapolis, is now building a super-speed car, designed by Fred S. Duesenberg, in an attempt to wrest the world's speed record from Major H. O. D. Segrave of London, or in competition to the fast automobile Kaye Don of England is experimenting with now at Daytona Beach, are absolutely without foundation, H. T. Ames, vice-president of Duesenberg, Inc., has announced.

Chevrolet Opens Plant

DETROIT, April 7—The Chevrolet Motor Co. today announces an expansion of its production capacity through the opening last week of the rebuilt and enlarged assembly and export plant at Tarrytown, N. Y. The new Tarrytown plant has a capacity of 900 cars daily and is one of the nine assembly plants and one of two export plants maintained by Chevrolet in the United States. The new plant is a one-story brick and steel structure, 1200 by 400 ft., with monitor type roof, providing for the maximum light and ventilation. Adjoining it is a new two-story office building, 200 by 60 ft., of concrete and brick construction.

The plant has two domestic assembly lines and an export boxing line.

Wins Tripoli Grand Prix

PARIS, March 25—Averaging 91 miles an hour for a distance of 65 miles, Borzacchini won the Tripoli Grand Prix road race, at the wheel of the 16-cylinder Maserati car entered for the Indianapolis event next May. Second place was taken by Arcangeli, also on a Maserati, at an average of 88.8 miles an hour, while Biondetti on a straight eight Talbot was third, with Prince de Serignano on a Maserati fourth and Ceriani on a Maserati in fifth place. While practicing for this race, Count Brilli Peri overturned with his Talbot car and was instantly killed. Brilli Peri had for several years been attached to the Alfa Romeo racing team and competed for them in leading European races.

General Motive Stock Listed

NEW YORK, April 7—General Motive Control, Inc., recently organized as a holding company for the American Viscosimeter Co., has had its stock listed on the New York Produce Exchange for trading. Officers of the company are Joseph Leopold, president, O. A. Stumpe, vice-president, and John G. Schork, secretary and treasurer. Mr. Leopold states that the company is now negotiating for the acquisition of other enterprises.

Urges Additional Tunnel

NEW YORK, April 7—The Automobile Merchants Association of New York, Inc., has issued a statement calling attention to the need for greater accessibility in New York, and urging a second tunnel in New York connecting the city in its midtown area with New Jersey.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries.

NEW YORK, April 9—Easter trade has been increasing; but general retail trade is sluggish, and it is reported that some of the large department stores in New York City are discharging many employees. There was a slight improvement in wholesale and jobbing trade last week.

CONSTRUCTION AWARDS

Average daily contracts awarded in 37 Eastern States, according to the F. W. Dodge Corp., amounted to $17,658,400 for March, as against $12,194,300 for February and $18,637,900 a year ago.

COMMERCIAL FAILURES

Commercial failures during March, according to R. G. Dun and Co., numbered 2347, as compared with 2262 during the preceding month and 1987 a year ago. Liabilities involved in the March failures amounted to $56,846,015, as against $51,326,365 in the preceding month and $36,355,691 a year ago.

CRUDE OIL PRODUCTION

Average daily crude oil production for the week ended March 29 was 2,514,200 bbl., as against 2,535,900 bbl. for the preceding week and 2,627,250 bbl. a year ago.

FREIGHT CAR LOADINGS

Railway freight loadings for the week ended March 22 totaled 875,542 cars, which marks a decline of 86,858 cars below those in the corresponding week a year ago and a decline of 74,652 cars below those in the corresponding week two years ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended April 5 stood at 90.8, as against 90.4 the week before and 90.7 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City for the week ended April 2 were 9 per cent below those in the corresponding week last year.

BROKERS' LOANS

Brokers' loans in New York City during the week ended April 2 increased $148,000,000, and the increase during the five weeks ended April 2 totaled $479,000,000.

FEDERAL RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended April 2 showed increases of $34,300,000 in holdings of discounted bills, of $44,800,000 in holdings of bills bought in the open market, of $1,400,000 in holdings of Government securities, and of $35,500,000 in member bank reserve deposits. The reserve ratio on April 2 was 79.8 per cent, as against 81.8 per cent a week earlier and 82.5 per cent two weeks earlier.

Erskine Predicts Better Business in Boston Talk

Sees Improved Second Half of the Year on Way

BOSTON, April 7—Given a series of questions on present-day conditions to answer preceding his prepared talk at the April luncheon of the Boston Chamber of Commerce here last Thursday, President Albert R. Erskine of the Studebaker Corp. of America gave some interesting sidelights of his ideas.

Giving the March production as being near the February figures this year, and saying that the first quarter would be 30 to 40 per cent or more under that of 1929, he indicated it was proof of the soundness of the automotive industry and its ability to meet any crisis. Unemployment was serious, he said, but that was improving. When the big public improvements get under way and the tariff question is settled, it will lead to opening up avenues of labor. This will lead to increasing the purchasing power.

Regarding the possibilities of sales of small cars by department stores, Mr. Erskine stated that was not a possibility. "In the first place, America will not take to the little $200 car we heard about to be sold in a packing case," he said. "It will be so small that pedestrians will run over it. Moreover, if the public demands a $200 car, Henry Ford will build it because he can put more value into it than some new manufacturer trying to create a newer market."

Perfect Circle Sales Steady

CHICAGO, April 7—Operations of the Perfect Circle Co. for the first quarter of 1930 were very satisfactory, although neither sales nor profits will quite equal the first quarter of last year, C. N. Teetor, president and general manager, has announced. February and March, however, show a substantial increase over January, and indications are that the second quarter will compare very favorably with the second quarter of last year. Sales to automotive equipment jobbers for replacement purposes showed an increase of 17 per cent in February over February of last year. March sales in this branch of the business also increased.

Feature Issues of Chilton Class Journal Publications

Commercial Car Journal and Operation & Maintenance—Special Truck Equipment Issue, April, 1930.

Ready This Week

French Export Value Drops

PARIS, March 25—French automobile exports for the first month of this year showed an increase in numbers of 3.3 per cent but a drop in value of 16 per cent compared with the corresponding month of last year. The number of trucks and tractors exported increased from 350 to 888; thus the total increase was brought up 22 per cent compared with January, 1929. The greatest volume of business was done with Algeria, the other countries in order of importance being Spain, Morocco, Belgium, Great Britain, Tunisia and Switzerland. Imports of passenger cars dropped from 398 to 450, but truck imports increased from 17 to 139. The United States sent 361 cars and trucks into France, while Italy supplied 128 passenger cars.

T. Worden Hunter

NEW YORK, April 7—T. Worden Hunter, president of the Bach Aircraft Corp., together with his pilot, R. W. McAllister, were killed at Roosevelt Field yesterday when their Bach monoplane crashed to the ground from a height of 300 ft. and burst into flames. The two men were returning from a visit to Bethany, Conn., and had arrived in New York on Wednesday of last week. They had planned to leave New York by plane today for Detroit to exhibit the monoplane in the show there.

Mack to Exhibit in Chicago

CHICAGO, April 7—Mack Trucks, Inc., has arranged for a loop exhibit of its trucks, tractors and other products of its three eastern factories, through a lease from the McClurg Building Corp. on the first floor and basement of the nine-story McClurg Building, occupying ground 80 by 172 ft.

Registrations in Wayne County Gain 43 Per Cent

End of First Quarter Shows Drop of 35 Per Cent

DETROIT, April 7—New passenger car registrations in Wayne County during March totaled 7852, an increase of 2361 or 43 per cent over the total of 5491 for February this year, and a decrease of 6040, or slightly more than 43 per cent from the total of 13,892 for March, 1929. The total for the first quarter this year was 17,235, a decrease of 9379, or slightly more than 35 per cent from the total of 26,614 for the first quarter of 1929.

Ford registrations of passenger cars last month totaled 4761, or 60.5 per cent of the total of all makes in the county. Chevrolet ranked second on the list last month with a total of 959 passenger cars, while Essex was third with 304, Pontiac fourth with 263, Buick fifth with 206 and Oldsmobile sixth with 172.

Commercial vehicle registrations for the county last month totaled 598 as compared with 468 in February and with 935 in March, 1929. Ford was first on the list last month with a total of 411 and Chevrolet ranked second with 96. Total of commercial vehicles registered during the first quarter of this year was 1483 as compared with 2255 in the corresponding period last year.

Peerless Acquires License

NEW YORK, April 7—Peerless Motor Car Corp. has acquired exclusive American license to manufacture a well-known European front-wheel drive, according to announcement made by J. A. Bohannon, president, today. It will be two or three weeks before the name of the European car will be made public, but Mr. Bohannon expressed himself as believing that the major features of its design are far in advance of anything now made in this country.

Inland Employees Benefit

CHICAGO, April 7—Inland Steel Co. employees this week received 16,102 shares of Inland common stock as a result of their participation in the company's employees' savings and profit-sharing pension fund. Almost 900 employees received stock certificates.

Calendar of Coming Events

SHOWS

Detroit (All-American Aircraft)..April 5-13
Asbury Park, N. J., Automobile..April 7-12
Berlin, International Automobile..Nov. 6-16

CONVENTIONS

National Council Meeting of the U. S. Chamber of Commerce, Washington .....April 28
U. S. Chamber of Commerce Annual Meeting, Washington...April 28-May 1
National Foreign Trade Conference, Los Angeles .....May 21-23
American Gear Manufacturers Association, Annual Meeting, Chicago..May 1-3
Society of Automotive Engineers, Summer Meeting, French Lick Springs May 25-29
National Conference on Street and Highway Safety, Washington.May 27-29
A. S. M. E., Semi-Annual Meeting, Detroit .....June 9-12
A. S. M. E., Oil, Power & Gas Div. State College, Pa. .....June 12-14
World Power Conference, Berlin..June 16-25
Railway Supply Mfrs. Assn., Meeting and Exhibit, Atlantic City..June 18-25
American Railway Association, San Francisco .....June 23-26
American Society for Testing Materials, Annual Meeting, Atlantic City .....June 23-27
Steel Founders Soc. (Midsummer Convention) White Sulphur Springs June 26-28
National Safety Council, Annual Safety Congress, Pittsburgh....Sept. 29-Oct. 4
Sixth International Road Congress, Washington, D. C. .....Oct. 6-11
Exhibition—American Roadbuilders Association, Washington, D. C....Oct. 6-11
Motor and Equipment Association, Convention, Cleveland.....Nov. 10-14

SALONS

Chicago, Drake Hotel .....Nov. 8-15
New York, Commodore Hotel.Nov. 30-Dec. 6

RACES

Daytona Beach, Fla., Speed Trials, April 1-15 (Extended Indefinitely)
Indianapolis .....May 30
Belgium .....July 5-6
Germany (Grand Prix) .....July 13
Belgium (European Grand Prix)....July 20
Spain .....July 27
Italy (Grand Prix) .....Sept. 7
France (Grand Prix) .....Sept. 21